The Augmented Reality Theater:

An Immersive Transmedia Experience

CHI 2014 Student Design Competition

Supplementary Material

Corrie Colombero | Andy Hunsucker | Pui Mo | Monet Rouse

Indiana University, Bloomington, IN

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Primary Research
Observations

We conducted trips to two different cinemas and one trip to a museum. We went to the AMC Cinema in Bloomington, IN, the IMAX Cinema in Indianapolis, IN, and the Children's Museum in Indianapolis, IN. We observed what experiences they offer and how people interact with the environment to get a deeper understanding of what people were interested in.

Primary Research
Observations

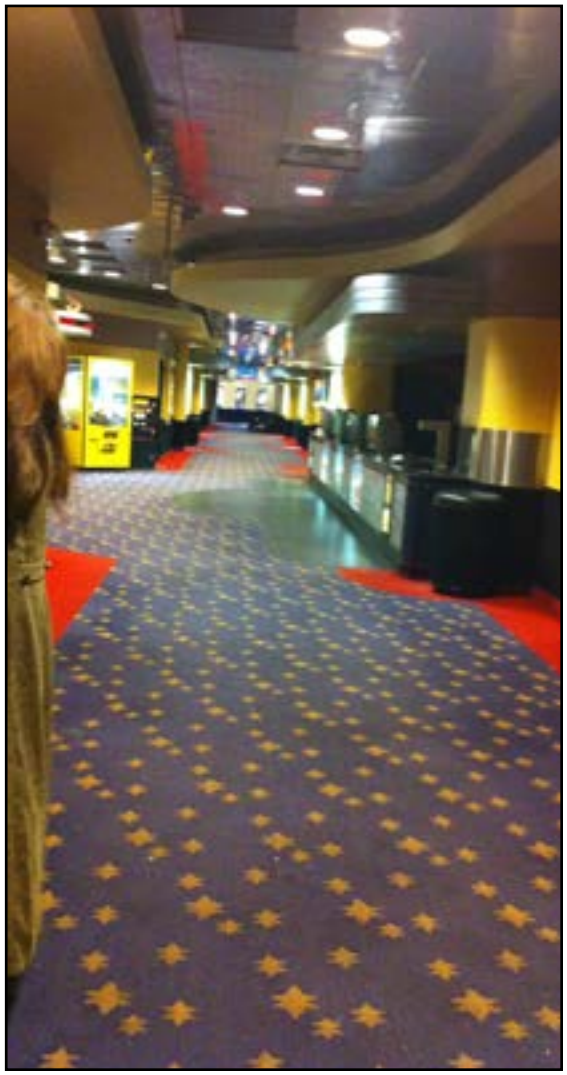
AMC Cinema in Bloomington, IN

We observed patrons in several different movies and the lobby noticing several trends.

- People waited in lines to get their tickets and food in the lobby
- People talked with each other about the movie they were going to see
- People rushed to the theater right after they got tickets or food because they wanted to get a better seat
- People played games on their phones while waiting for the movie to begin
- As people left they were on their cell phones or talking to whoever they came with

These observations revealed possible opportunities to improve current conventional theaters. The lobby could be more attractive to patrons, the environment could encourage conversations, and interactions between patrons could increase.

Primary Research
Observations

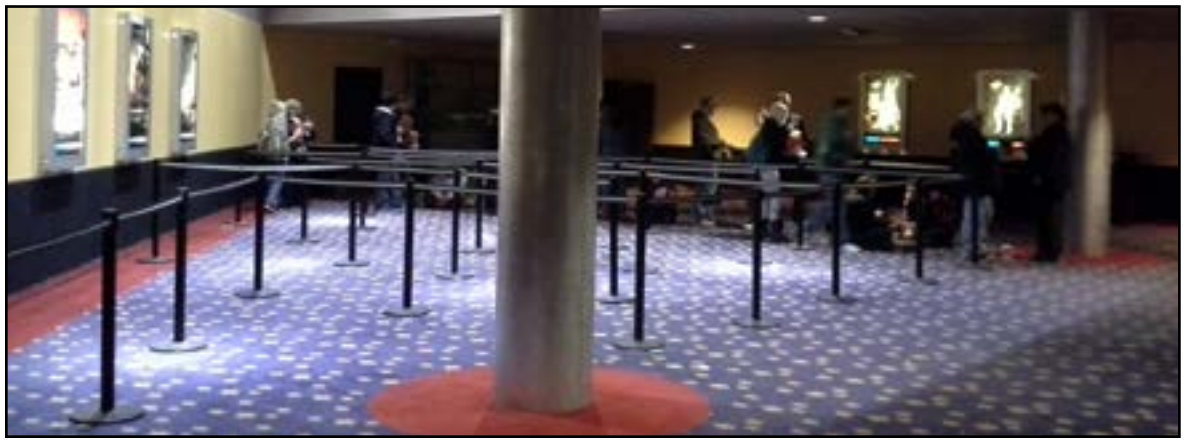


AMC IMAX Cinema in Indianapolis, IN

We visited this IMAX Cinema to experience a premium movie theater experience. At this theater we noticed the following:

- Long hallway leading to the theater
- Smaller lobby for the separate IMAX Cinema

This trip gave us insights on how a long hallway could be utilized to ease patrons into the experience. Our original design took place in a single shared lobby. We realized this would cause problems with the wide variety of genres and styles of films and experiences. It became clear that individual lobbies for each film was a better solution.



Primary Research
Observations

Children's Museum in Indianapolis, IN

We visited this museum to explore immersive and interactive experiences. In this museum, we observed the following:

- The Dino Sphere: an interactive experience featuring dinosaur fossils including sound effects and light shows along with felt experiences
- Direct interactions with archaeologists: allowing patrons to get a broader perspective of the exhibits and installations
- Interactive games and play: digging for fossils and costumes for children

We learned more about how patrons participate in immersive, open-ended, and interactive experiences.

Primary Research

Expert Interviews

We conducted three interviews with experts in theater exhibition, the movie industry and experience design. We gained many insights from their perspectives.

Jon Vickers - Director of the Indiana University Cinema

- Feels content, newness, the experience of being with an audience, and becoming immersed in the experience are the most important factors for people to decide whether they will watch movies in theater.
- Likes going to places that have a uniqueness to them. The place is important. Multiplexes are all similar to each other.
- Likes to talk to people about the film. If seen alone, he seeks out people to talk to about the film afterwards.
- Thinks IMAX experiences originally were for science or educational films. Experiences were incredibly immersive when true IMAX films were involved.

Primary Research

Expert Interviews

Sean Connolly- Former Story Editor at Universal Pictures

- Movie studios want to create more experiences that people can only have in the theater. Movie theaters' business relies on people coming into the theater.
- Movie studios get more money during the first weekends of a films release, theaters get more money later in the films release. Giving people a reason to come back to the theater is huge.
- Material (for our experience rooms) will be created by studios and in many cases can be reused from existing assets.
- Stars of the films can be counted on to participate through contracts, much like they do now for theme park rides.
- This could be incorporated into a museum setting.

Erik A. Stolterman - Professor and Chair of Informatics at the School of Informatics and Computing, Indiana University, Bloomington

- Designing for a whole theater system is good for integrating the experience.
- The experience in our design compares to actual movie phases: preparation, build-up, initiation, climax, wind down.

Primary Research

Interviews

We conducted four interviews with avid moviegoers. We asked questions that included: "What makes you decide to see a movie in the theater or at home?", "Describe your favorite movie theater. What makes it great? ", and "Describe the worst theater you've ever been to? What made it bad?". This helped us to gain a better understanding their needs.

Barbara O'Leary

- Chooses to see a movie in theater "if the film seems like it will be more fully experienced on a large screen in an uninterrupted way."
- Her favorite movie theater: extremely high standard of presentation
- Her great movie experience: a wonderful film beautifully presented in a movie house with a low distraction environment and moviegoers who are eager to experience the film fully and who feel free to laugh, gasp, enjoy the film going experience fully.

Megan Eller

- Chooses to see a movie in theater because some movies need to be seen in a theater
- Her favorite movie theater: "people respect movies there and tend not to be distracting"
- A great experience: "I can immerse myself in the experience."
- On making a theater more engaging: "I'm not sure how to make a movie more engaging in a theater (other than just making it more engaging overall, if that makes sense)."

Primary Research

Interviews

Sahar Pastel-Daneshgar

- Chooses to see a movie at the theater based on the availability of the movie (is it available otherwise or is it 3D) and the quality of viewing experience
- Favorite movie theater: Technically advanced
- Great movie experience: Good movie, good seats, and a good audience of people responding to and with the movie (especially kids)
- Impressed by midnight shows of Harry Potter movies: "Everyone was dressed up, there was trivia, a costume contest and everyone was excited to be there."
- "It's hard to please every single person and keep the integrity of the film."

Lisa Trifone

- Common complaints: "it was around ticketing/seating - if people had to wait for the previous movie to end, etc."
- Best theater experience: more about the film and the shared experience than the four walls around us.

Secondary Research

Previous work helped us to understand this design space.

“The desire for immediacy would appear to be fulfilled by the transparent technologies of straight photography, live television, and three dimensional, immersive computer graphics. Such transparent technologies, however cannot satisfy that desire because they do not succeed in fully denying mediation. Each of them ends up defining itself with reference to other technologies, so that the viewer never sustains that elusive state in which the objects of representation are felt to be fully present.” [1]

Source: Remediation

“Boorstin’s analysis of film suggests that, in a media-saturated world, enchantment may be possible through a combination of the wonder of sensory experience, emotional response, and direct playful engagement.” [2]

Source: The experience of enchantment in human-computer interaction.

“Meaning is neither inside the mind nor outside in the world: It is in-between the human being and the world. We perceive the world in terms of what we can do with it, and by physically interacting with it we access and express this meaning. Meaning is created in interaction.” [3]

Source: Matter of Transformation: Designing an Alternative tomorrow inspired

Secondary Research

"The main objective of this concept is to provide an experience that is close to the real situation, immersiveness acts as a key element. As a means to develop an application based on the immersive tour experience concept, AR technology was selected." [4]

Source: Designing and Immersive Tour Experience System for Cultural Tour Sites

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"Immersion, or transportation, has been particularly associated with interactive media. "Interactive media may be particularly transporting, and thus particularly enjoyable, forms of entertainment because they allow users to easily leave their physical and psychological realities behind and become fully immersed as an active participant in the narrative of an alternative, 'virtual' reality" [Green et al. 2004]." [5]

Source: Interactive stories and the audience: Why empathy is important.

"Let transmedia stand for those multi-sensory natural experiences: trans-action, trans-sensory. Let it stand for the mix of modalities: reading and writing, speaking and seeing, listening and touching, feeling and tasting. Let it stand for actions and behavior, thought and emotion." [6]

Source: The Transmedia Design Challenge: Technology that is Pleasurable and Satisfying

Technology
Augmented Reality

http://www.youtube.com/watch?v=uugSKyd_kIY

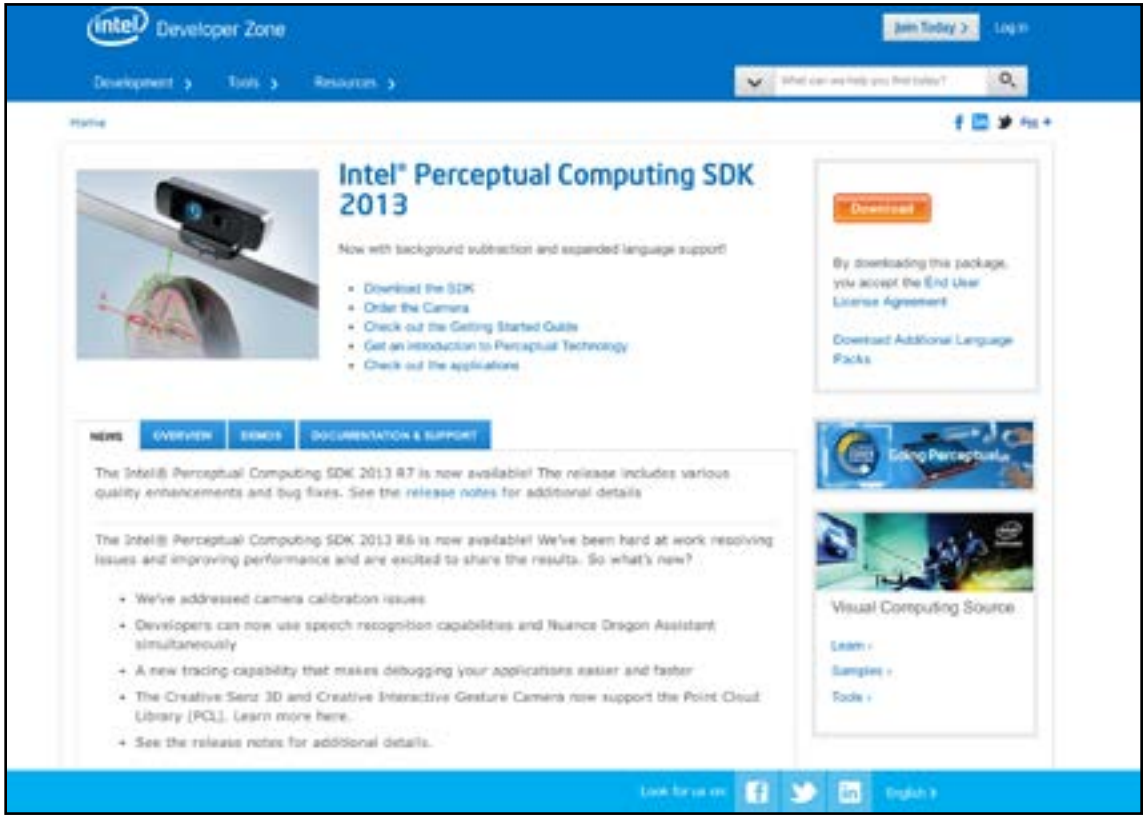
This video demonstrates the Sony SmartAR technology.

SonySmartAR

"An AR system supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world" [7].

Through the research, we found that the augmented reality technology is well developed and now being used in many applications. By utilizing this technology, we use the method of transmedia storytelling integrating multiple medias to provide a more vivid experience to the audience.

Technology
Perceptual Computing



http://software.intel.com/en-us/vcsource/tools/perceptual-computing-sdk

Intel Perceptual Computing cameras allow us to track body positioning, facial expressions, and gestures in the experience rooms.

Technology

Revel

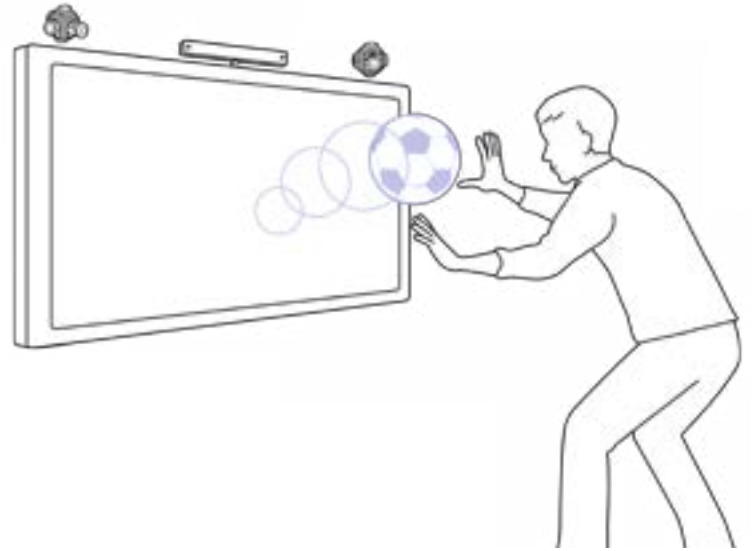
http://www.disneyresearch.com/project/revel-programming-the-sense-of-touch/

"REVEL is a new wearable tactile technology that modifies the user's tactile perception of the physical world. REVEL can add artificial tactile sensations to almost any surface or object, with very little if any instrumentation of the environment. As a result, REVEL can provide dynamic tactile sensations on touch screens as well as everyday objects and surfaces in the environment, such as furniture, walls, wooden and plastic objects, and even human skin" [8].

By using this technology, we do not require the patrons to wear gloves or other devices. We believe that by providing multiple sensations to the audience, immersion in the environment is enhanced.

Technology

AirReal

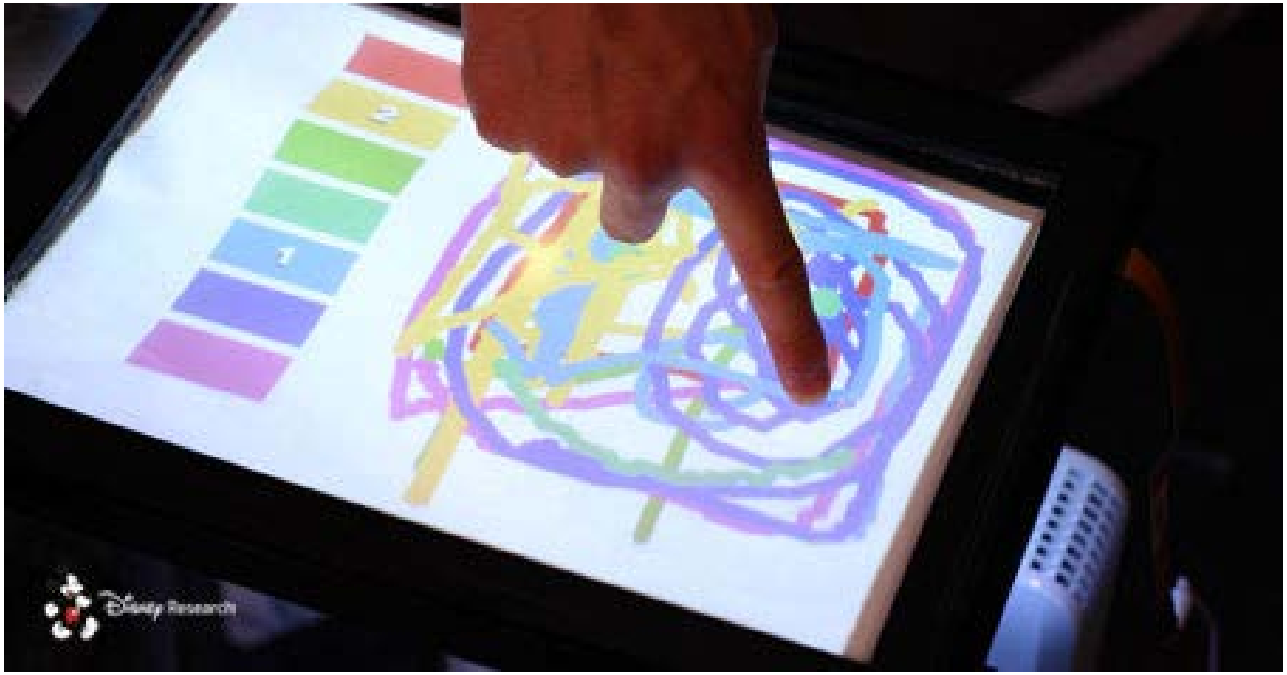


http://www.disneyresearch.com/project/aireal/

"AIREAL is a new low cost, highly scalable haptic technology that delivers expressive tactile sensations in mid air. AIREAL enables users to feel virtual objects, experience dynamically varying textures and receive feedback on full body gestures, all without requiring the user to wear a physical device" [9].

Through our research, we found that adding a sense of touch to the experience would increase immersion.

Technology
Capacitive Fingerprinting



http://www.disneyresearch.com/project/capacitive-fingerprinting/

This technology allows us to identify people based on their natural electrical impedance [10]. While we initially thought that this technology would allow us to identify patrons when they touch the walls. We realized too many variables exist to reliably identify someone since, among other factors, every item of clothing they are wearing contributes to their natural impedance.

Existing Systems

We researched many interactive systems in the augmented reality space and in current movie theater technology.

Google Glass

This wearable technology allows the user to see augmented reality overlays around their environment while living their daily lives.

Playstation 4

The Playstation 4, with the optional camera, allows for the user to play augmented reality games in their living room. The PS4 includes Augmented Reality Robots and a game based on air hockey.

Oculus Rift

The Oculus Rift is a head mounted display that allows the user to be fully immersed in a virtual world. One of the applications of this device is to simulate a movie theater experience.

Existing Movie Theaters

Premium movie theaters like the Alamo Drafthouse in Texas focus on improving the in-theater experience by serving food and drinks to the seated patrons and designing special events. Most theaters in the US employ Stereoscopic films (3D) to enhance the depth perception of films. IMAX theaters improve the picture and sound quality to enhance the film experience.

Inspiration

We drew inspiration from many immersive experiences and observations.

Pictured above is an image of the dome of a planetarium at the Children's Museum in Indianapolis, IN. Experiences like this are designed to immerse the audience completely, much like our experience rooms and theaters.

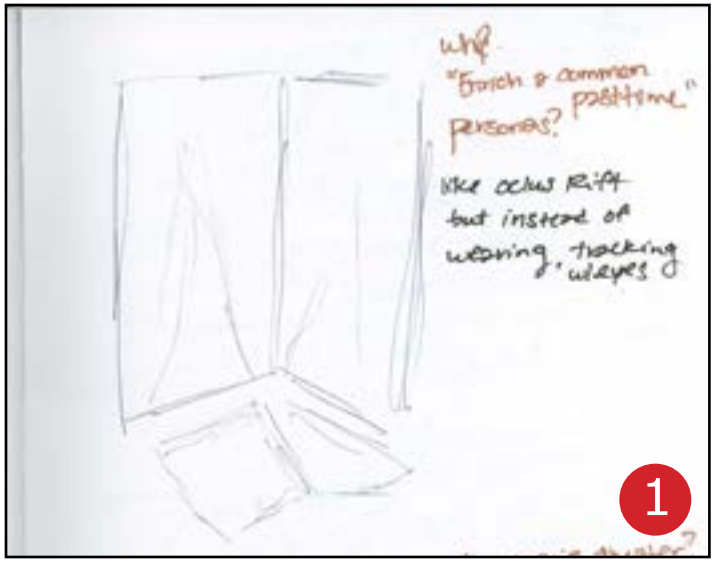
Inspiration

We drew inspiration from tactile experiences where a patron is invited to touch an artifact [Fig.1], much like patrons in our experience will be invited to touch the walls.

http://gfx.dagbladet.no/labrador/146/146373/14637310/jpg/active/978x.jpg

In the film "The Chronicles of Narnia" [Fig.2], characters discover a new hidden world by entering a wardrobe, and walking through an enclosed space. The new world slowly encroaches as they walk further. We took inspiration from this idea to design the slow-change hallway leading to our experience.

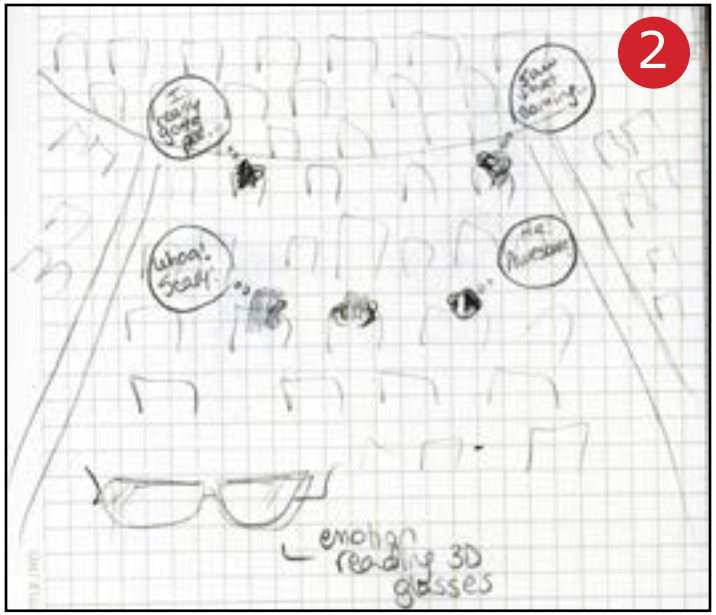
Exploration Sketches

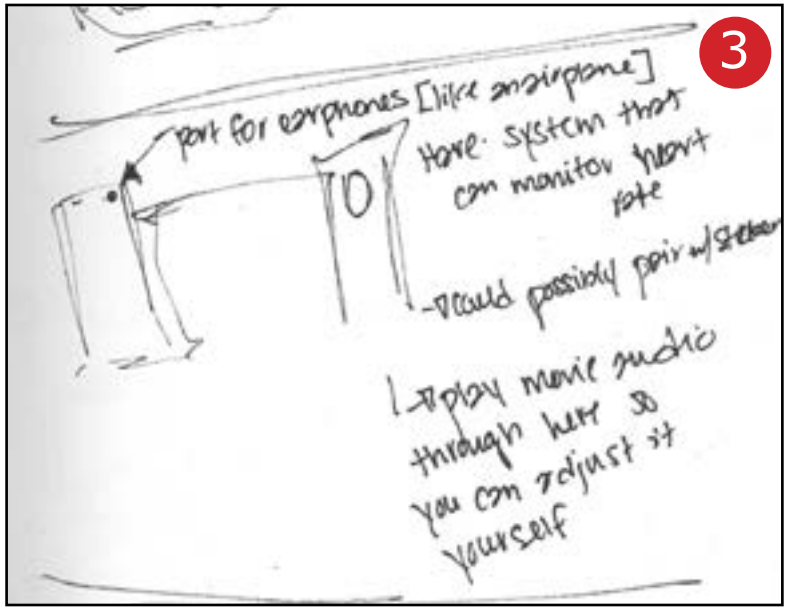


Here we see several ideas we didn't ultimately pursue. We considered interactive movie posters to improve the lobby space [Fig.1].

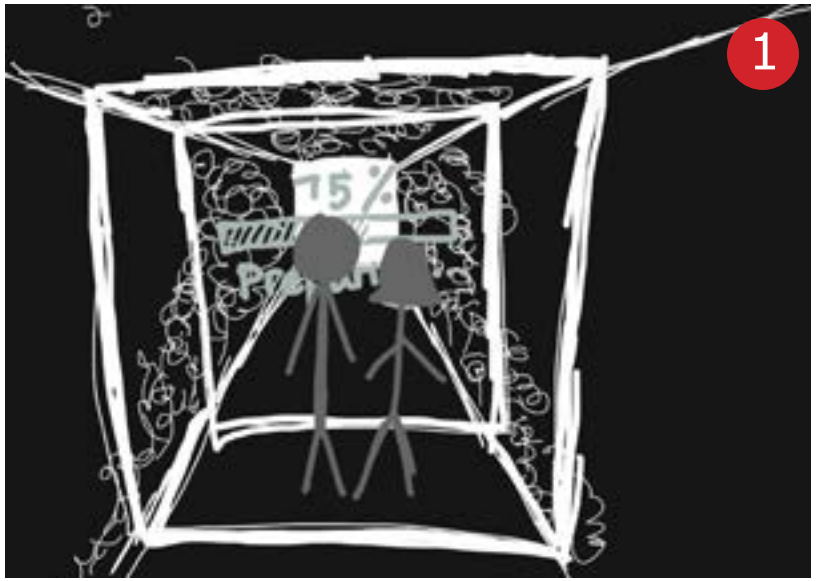
We also pursued ways to sense the viewers emotion during a film [Fig.2] We thought that this idea could be used for filmmakers to see how people felt during their films, or possibly change the film based on user emotions.

We also looked at ways to customize the experience within the theater, such as personal volume controls [Fig.3].





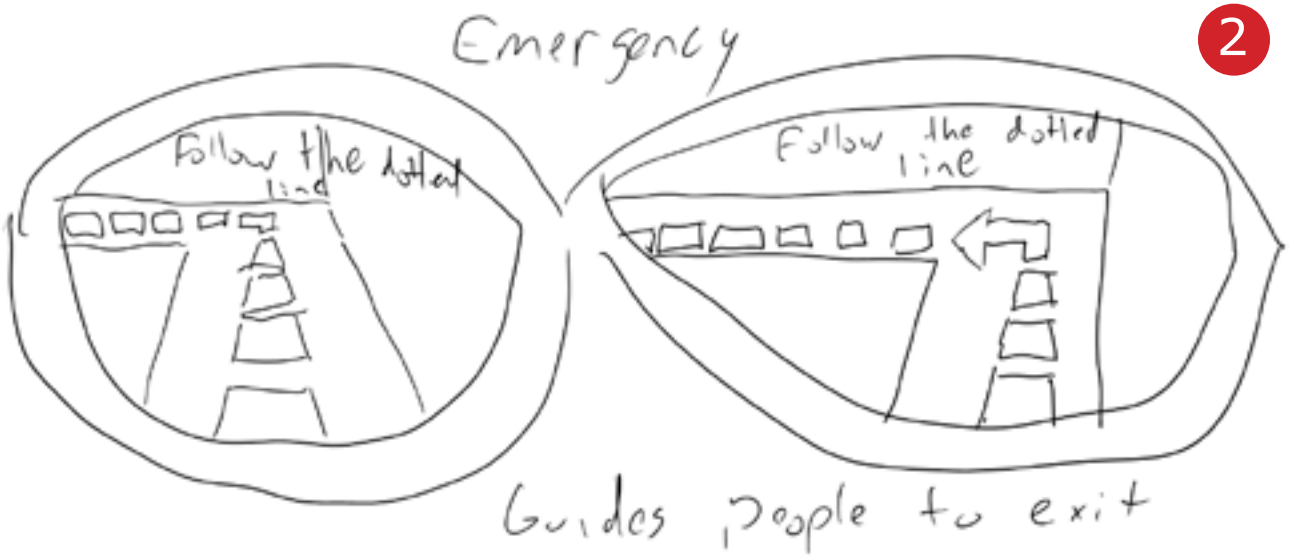
Exploration Sketches



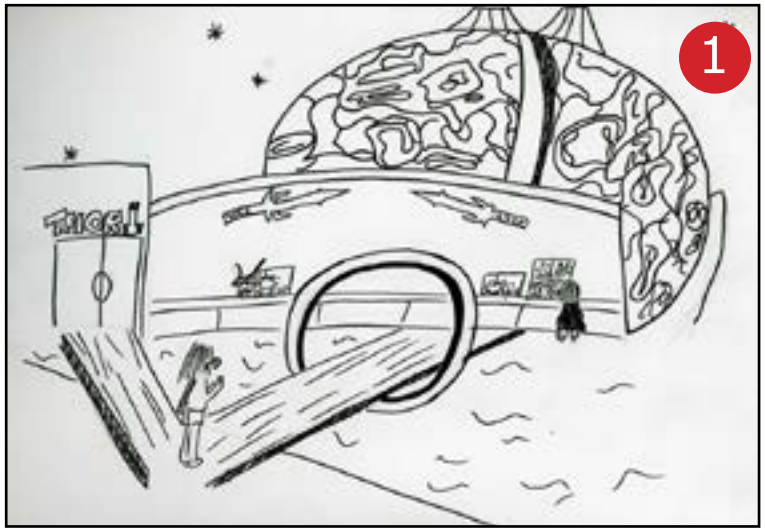
An early concept of the long hallway leading to the experience room [Fig.1].

A concept of what the glasses would show in an emergency [Fig.2].

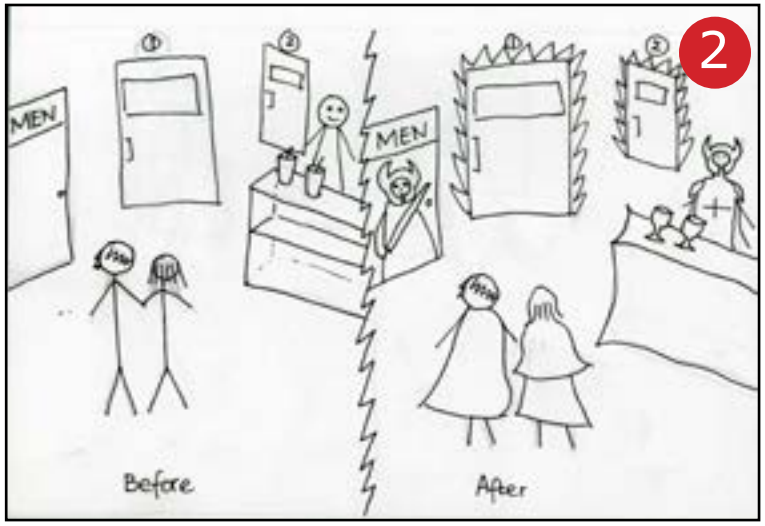
A mascot character that could be used in the lobby of the theater to give instructions and safety information [Fig.3].



Early Iteration Sketches



In our first iteration, we did a sketch imagining the main lobby as the center of the immersive experience [Fig.1].



A before and after sketch imagining what patrons would see after putting on the glasses [Fig.2].

Final Concept Sketches

We created Augmented Reality Theater Glasses (ART Glasses) containing high rendering power capabilities to generate augmented reality and provide a connection to the perceptual computing cameras. A small speaker embedded in the side enhances the augmented experience.

Final Concept Sketches

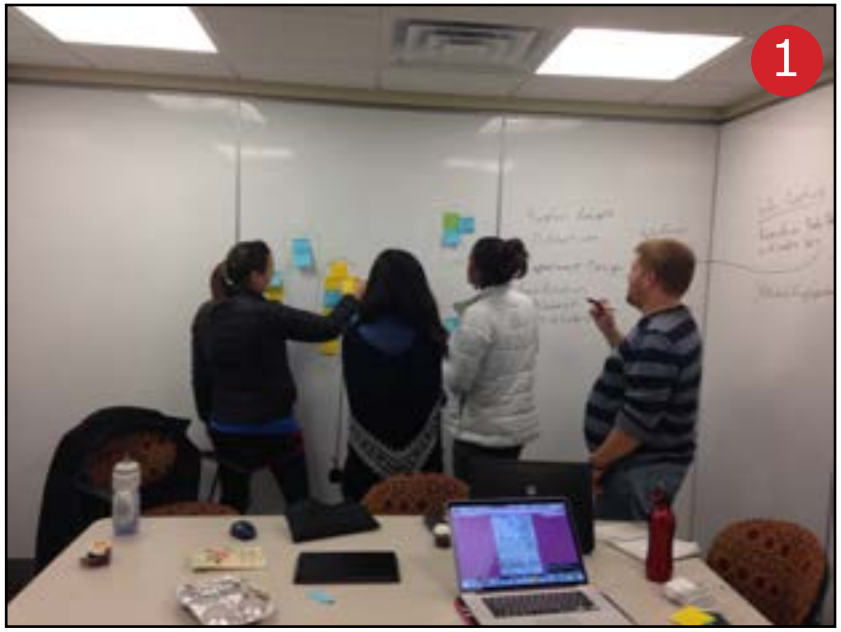
http://img3.douban.com/view/photo/raw/public/p1428008864.jpg

Patrons socializing and interacting in the experience room based on The Hobbit [Fig.1].

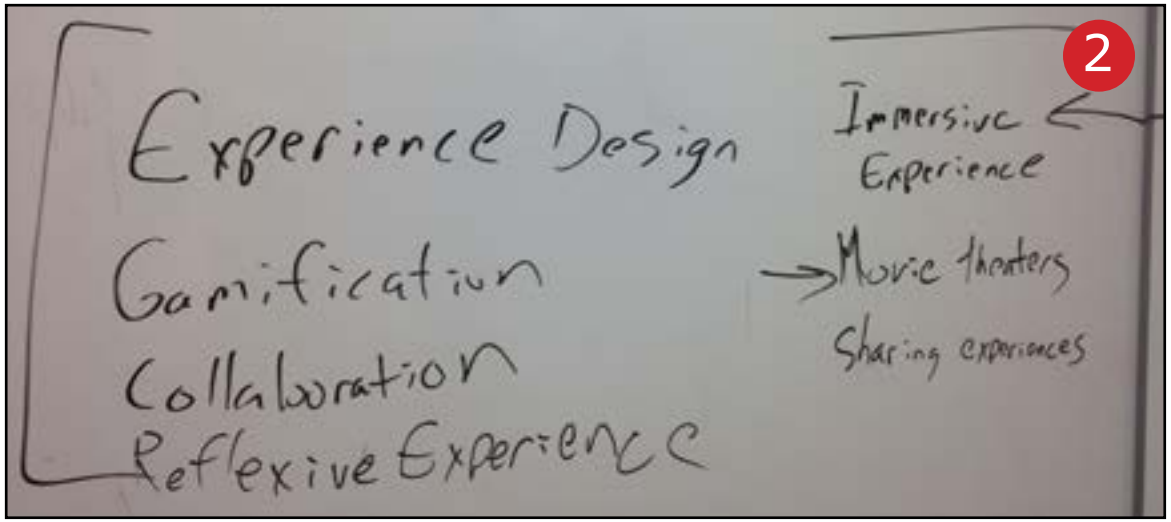
http://m.1023bob.com/files/dungeon.jpg

Patrons walking through the slow-change hallway based on The Hobbit [Fig.2].

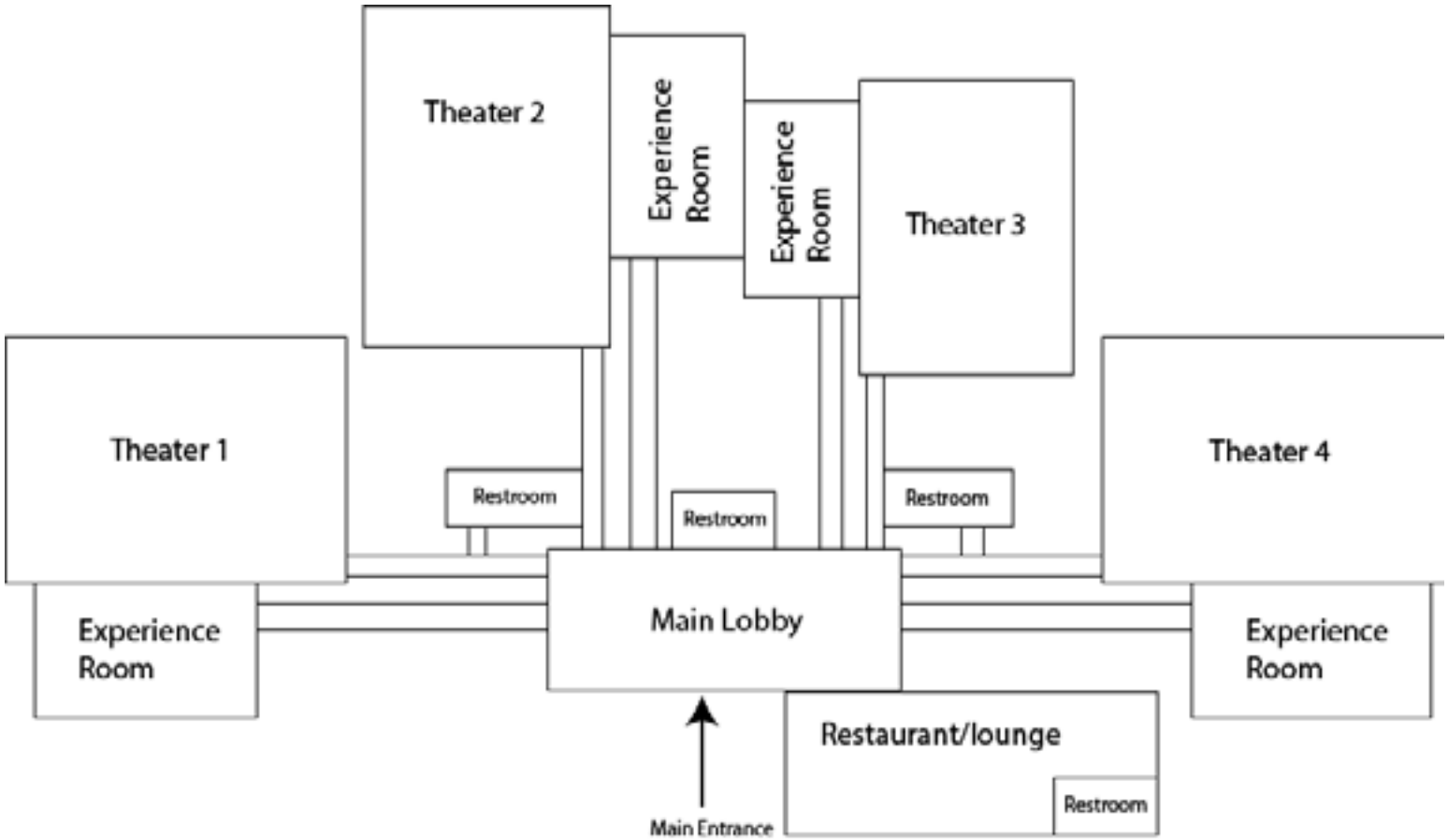
Group Ideation



We began our process by using affinity diagramming to select the group we wanted to design for [Fig.1]. We quickly agreed on moviegoers and explored what kinds of problems and opportunities exist in this space. While our early discussions centered on distractions in the movie-going experience, we decided to explore where the experience could be most improved [Fig.2].

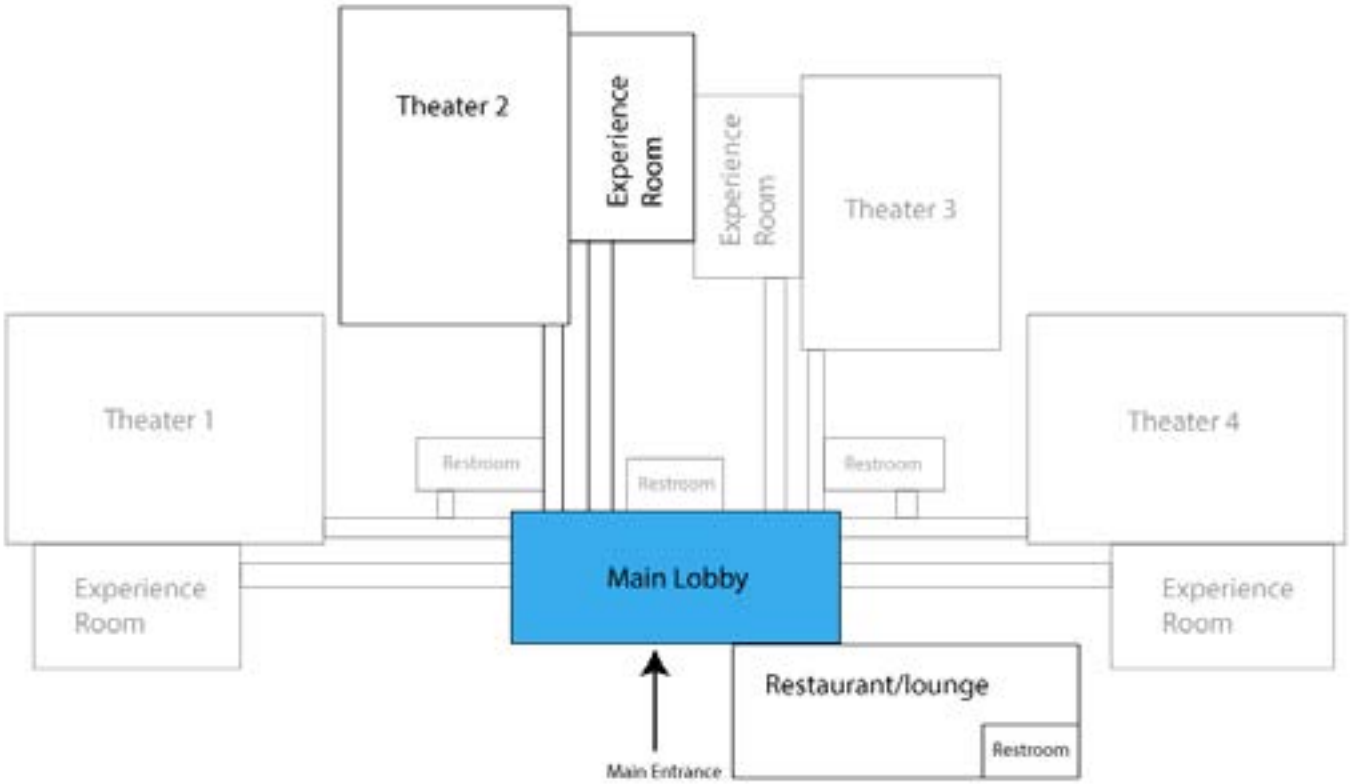


Theater Experience Walkthrough



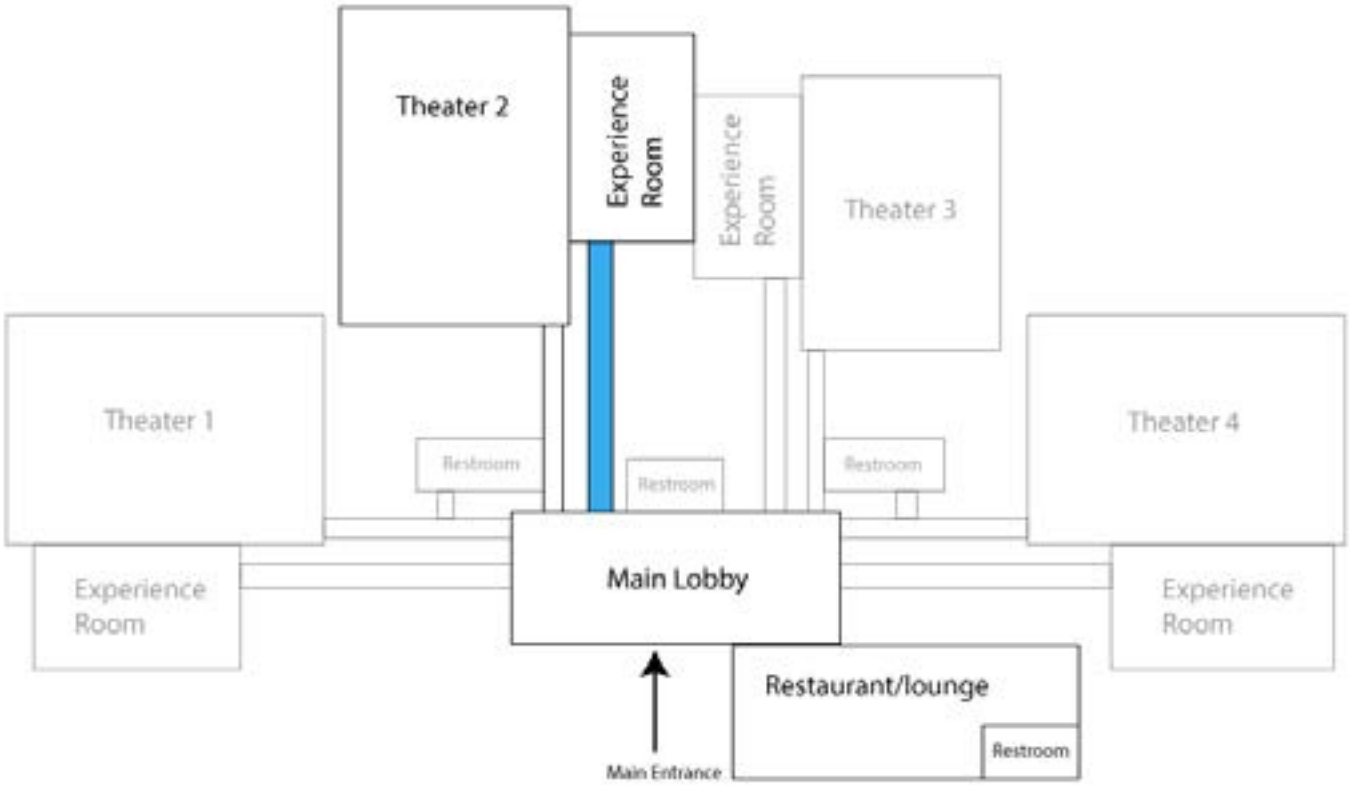
The image above shows the proposed layout of the theater. In this section we will walk you through the experience of Susan, a patron of the theater.

Theater Experience Walkthrough



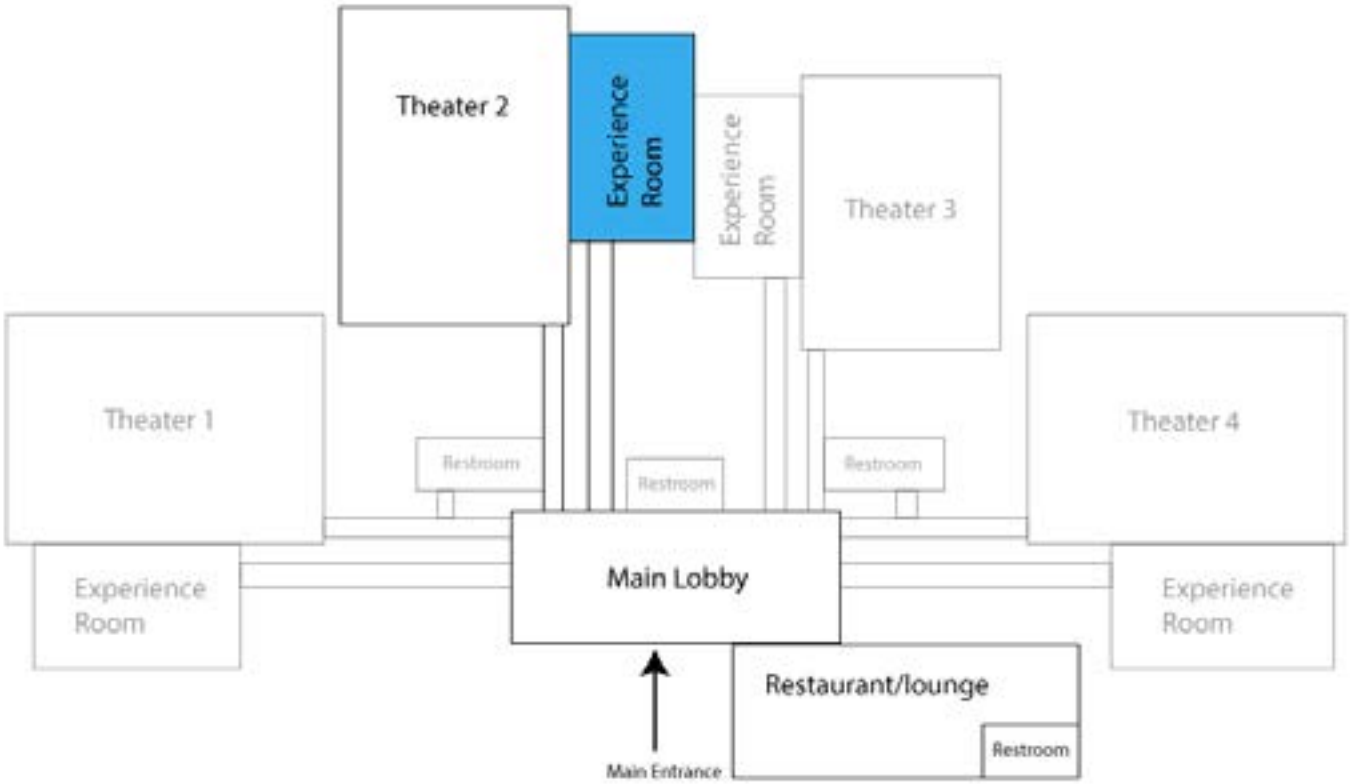
Susan enters the main lobby and purchases a ticket from an attendant for The Hobbit. She is able to select her preferred seat and receives her Augmented Reality Theater Glasses. She puts her glasses on, and she is greeted by an augmented character in the lobby who explains what she can expect and any pertinent safety information. Susan listens and the character leads her to her destination.

Theater Experience Walkthrough



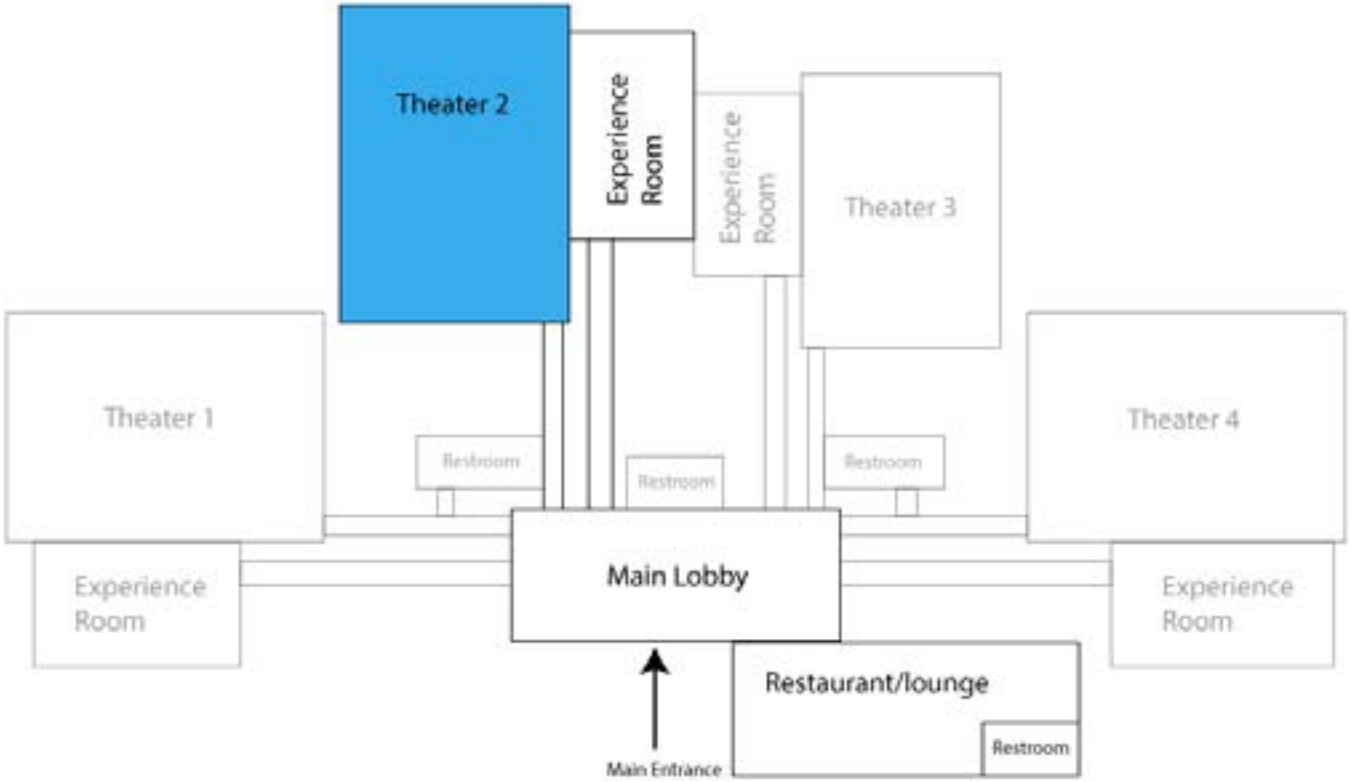
Susan enters the doorway and is presented with a long hallway. As she walks down the hallway the environment slowly changes around her into a stone dungeon. She puts her hand on the wall and feels the stone bricks and the mortar between them (via REVEL technology). She reaches the end of the hall and exits through a large wooden door.

Theater Experience Walkthrough



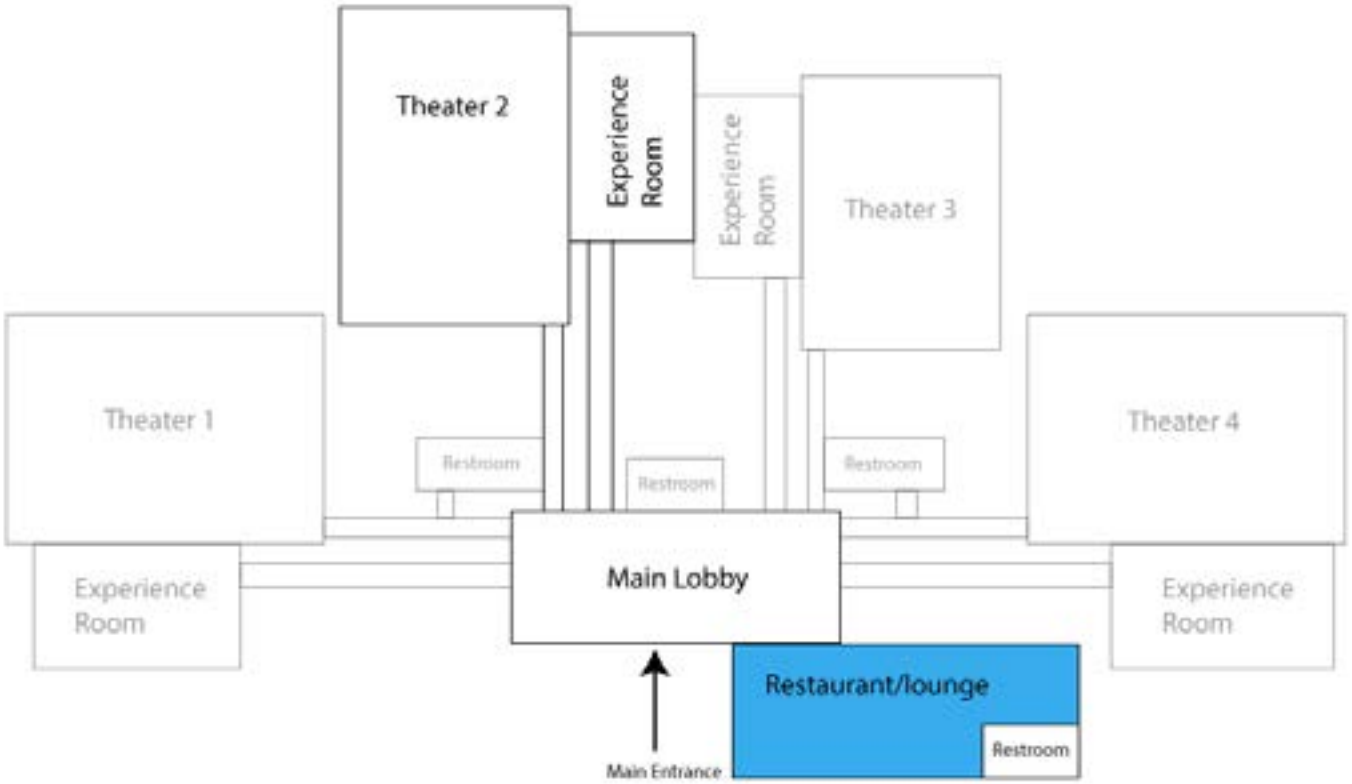
Susan enters the experience room and discovers she is in dragon Smaug's dungeon. The floor is covered with gold coins that appear to move as people walk over them. Susan reaches into piles of coins and feels them brush past her hands (via AirReal technology). Smaug flies into the room and stares directly at Susan; she can feel his breath on her face. "Enter...if you dare...", he says. Susan makes her way to the theater.

Theater Experience Walkthrough



Upon entering the theater, Susan sees her seat highlighted is able to easily find it. The screen is curved and extends into her periphery. As the film starts, the virtual environment changes to match the movie scene currently playing so that she is completely immersed in the film.

Theater Experience Walkthrough



After the film ends, Susan exits through a different long hallway that looks like a stone dungeon. As she walks down it slowly turns back into a normal hallway. She exits the theater, returns her glasses, and heads to the lounge to have a drink and talk to other guests about the experience.

Usability Test and Focus Group

http://vimeo.com/83104844

We conducted focus groups to test our design through the scenarios we created to get insights for further iteration of the design. This video shows excerpts from one session.

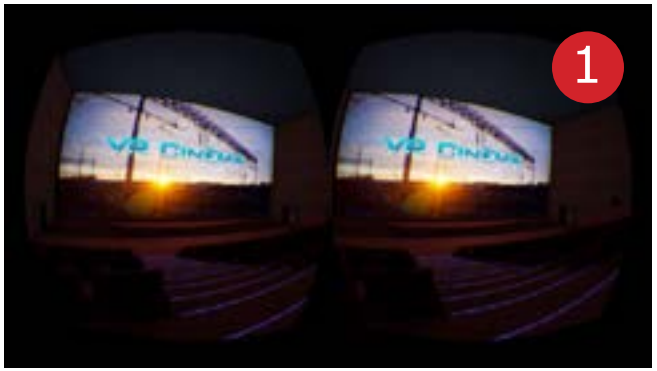
User Testing Process and Insights

Our user testing group was all female ages 21-27 from a wide variety of cultural backgrounds. There was a mix of casual and avid moviegoers. We walked them through a scenario that involved them purchasing tickets, viewing mixed reality movie posters, walking through the slow change hallway, spending time in the experience room, watching the film, and visiting the lounge. During the scenario, we asked them if they would actually use the feature we were presenting to them. After the scenario was complete we asked them general questions about the design in a focus group format. This gave us several insights:

- An earlier phase of the design included mixed reality movie posters. We intended these to be replacements for trailers. We learned from the user testing that our users weren't particularly interested in this feature. It was removed from further iterations.
- We asked users if no trailers before the film would be a concern. One participant said she would miss them, but the other users all agreed that trailers for other films would detract from the experience we were trying to create.
- Participants expressed concerns that they wouldn't be able to find a good seat if they were spending their time in the experience room. This lead us to design a way for users to select their seats before the film.
- Our users also reacted positively to the idea of a lounge space in the theater that they could visit after the film. Several mentioned they often spend extra time in movie theater hallways with friends discussing the film.
- Overall, we found that our users wanted an interactive an inviting experience.

Future Testing

Because our design involves a complex system requiring technology that is still in the development stage, we were not able to build a fully functional prototype. We recognize this limitation, and our user testing attempted to give users the impression of what they might be experiencing.



Some other ideas of how we might test this design in the future include:

- Using a technology like the Oculus Rift to give users a virtual reality experience - In this scenario, we would use the VR Cinema program [Fig.1] [11] to mockup our in-theater experience and allow the user to describe the sensation of watching a movie with additional stimulus.
- Continued testing and research with the technologies as they develop.
- Talking to a licensed architect to discuss ways this space could be built.

Problems that existed within our design undergoing iteration include current time delays with perceptual computing. We are designing 5-10 years in the future; it is conceivable that this issue will be resolved, or is already resolved in developing technologies. Subtle moving chairs within the theater are proposed, but more research is needed to ensure patrons will not be distracted by the movement of seats.

Thanks

Corrie Colombero

Andy Hunsucker

Pui Mo

Monet Rouse

Reference

[1] Bolter,Jay D. & Grusin., Richard. Remediation. The Johns Hopkins University Press and the Society for Literature and Science. (1996), 311-358.

[2] McCarthy, J., Wright, P., Wallace, J. and Dearden, A. M. The experience of enchantment in human-computer interaction. Personal and ubiquitous computing, 10 (6), (2005), 369-378.

[3] Hummel, C. & Levy, P. Matter of Transformation: Designing an Alternative tomorrow inspired. Phenomenology. Interactions. November-December (2013).

[4] Park, D., Chung-Kon Shi., Tek-Jin Nam. Designing and Immersive Tour Experience System for Cultural Tour Sites. CHI 2006, April 22–27, Montréal, Québec, Canada.

[5] Hand, S. and Varan, D. Interactive stories and the audience: Why empathy is important. ACM Computers in Entertainment. 7, 3, Article 39 (September 2009), 14 pages.

[6] Norman, Donald A. The Transmedia Design Challenge: Technology that is Pleasurable and Satisfying. Interactions, January + February, (2010), 12-15.

Reference

[7] Behringer, R., Feiner, S., Julier, S., and MacIntyre, B. Recent Advances in Augmented Reality. IEEE Computer Graphics and Applications (2001), 34-47.

[8] Bau, O. and Poupyrev, I. REVEL: Tactile Feedback Technology for Augmented Reality. ACM Transaction on Graphics - ACM SIGGRAPH (2012).

[9] Sodhi, R., Poupyrev, I., Glisson, M., and Israr, A. AIREAL: Interactive Tactile Experiences in Free Air. In Proc. ACM SIGGRAPH(2013).

[10] Harrison, C., Sato, M., Poupyrev, I. Capacitive Fingerprinting: Exploring User Differentiation by Sensing Electrical Properties of the Human Body. In Proceedings of ACM UIST 2012, (2012).

[11] Oculus VR - VR Cinema. https://share.oculusvr.com/app/vr-cinema