DES Report

Designing an interactive technology in a museum

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Approval Sheet

Design Exploration Studies titled "**Digital Museum Exhibit- Interactive AR technology in Virtual Museum Exhibits**" by Shivangi Negi, (roll number 216330018) is approved for partial fulfillment of the requirement for the degree of 'Masters in Design' in Interaction Design at IDC School of Design, Indian Institute of Technology, Bombay.

Guide:

Sumant M Rao

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Declaration

I hereby declare that this document contains my original ideas and exploration. I have adequately cited and referenced the original sources wherever they have been used as a part of this project. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.



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Abstract

The aim of the project is to explore the potential of interactions, particularly augmented reality (AR) interactions, that are possible in a museum exhibit. The study focuses on the micro-interactions that can occur while using smartphones, tablets, interactive screens, projectors with sensors and other similar devices. It aims to identify how technology can contribute to enhancing the visitor experience in museums. The research methodology includes primary research on the Ajanta Virtual Exhibit, case studies of other exhibits, and secondary research from other sources. The findings of the study suggest that the use of technology can significantly improve the engagement of visitors with museum exhibits, making the experience more interactive and immersive. Finally, the research is applied to the case study of Basava International Museum to provide practical insights into the implementation of AR interactions in a museum exhibit.

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1. Introduction

1.1 Micro interactions

According to Dan Saffer author of Micro-interactions: Designing with Details - "A micro-interaction is a simple interaction which triggers after a certain condition and makes the user do a certain action. Depending on the user's decision, it closes or triggers another action." Micro-interactions are events which have one main task — a single purpose — and they're commonly found within mobile apps. Their purpose is to delight the user and create an engaging and welcoming moment. Micro-interactions can enhance the UX by offering subtle guidance and feedback to the user. Combined small, preferably functional animations that support the user by giving visual feedback and displaying changes clearly can enhance the overall user experience.

Micro interaction has 4 parts:

- a. Trigger
- b. Alert
- c. Feedback
- d. Loops & Modes



1.1.1. Trigger

A trigger is the physical or digital control or condition(s) that begins a micro-InterAction. Triggers are of two types:

- Manual Trigger: Manual triggers are user initiated, and can be a control, an icon,

a form, or a voice, touch, or gestural command

Manual triggers usually spring from a user want or need. The second principle of triggers, although it seems incredible to even have to say this, is have the trigger initiate the same action every time. The third principle of manual triggers is to bring the data forward.

Components of a trigger:

- Controls For manual triggers The kind of control you choose can be determined by how much control you want to give.
- Making manual triggers discoverable The most discoverable triggers are (from most discoverable to least)
 - a. An object that is moving, like a pulsing icon
 - b. An object with an affordance and a label, such as a labelled button
 - c. An object with a label, such as a labelled icon
 - d. An object alone, such as an icon
 - e. A label only, such as a menu item

f. Nothing: an invisible trigger

Control states of manual Triggers:

Some manual triggers have multiple states. Although in most cases you won't have all of these states, when designing a trigger, you should consider them.

- 1. Default the idle state when there is no activity.
- 2. Active If there is an activity working in the background—for example, downloading an update or syncing—the trigger could be used to indicate that.
- 3. Hover
- Rollover is often used to indicate presence or activity, or just an added indicator that the cursor is positioned correctly to engage on click/tap/in process,
- 5. What happens when the trigger is clicked, tapped, or begun.
- 6. Toggle Switches and buttons can indicate their current setting (left/right, up/down, or pressed/unpressed, respectively).

Labels for manual Triggers

The purpose of a label is clarity: is what I'm about to do the thing I want to be doing? Labels put a name to action and create understanding where there could otherwise be ambiguity.

System triggers

System triggers are those that engage when certain condition(s) are met without any conscious intervention by the user. Along with that, when it comes to storytelling, there is a

need to lead the user to interact with the micro-interaction, in case they digress from the interaction.

1.1.2. Rules

Rules create a nontechnical model of the micro interaction—they define what can and cannot be done, and in what order. Perhaps the most important part of the rules is the goal. Before designing the rules, you need to determine in the simplest, clearest terms what the goal of the micro-interaction is. The best goals are those that are understandable (I know why I'm doing this) and achievable (I know I can do this). Make sure the goal you're defining isn't just a step in the process; it's the end state. For example, the goal of a login micro-interaction isn't to get users to enter their password; the goal is to get them logged in and into the application. The more the micro-InterAction is focused on the goal rather than the steps, the more successful the micro-interaction is likely to be. The goal is the engine of the rules; everything must be in service toward it.

The rules determine:

- 1. How the micro-interaction responds to the trigger being activated.
- 2. What control the user has (if any) over a microinteraction in process
- 3. The sequence in which actions take place and the timing thereof.
- 4. What data is being used and from where.

1.1.3. Feedback

Feedback should occur:

- 1. Immediately after a manual trigger or following/during a manual adjustment of a rule.
- On any system-initiated triggers, the state of the microinteraction (or the surrounding feature) has changed significantly. The significance will vary by context and will have to be determined on a case-by-case basis by the designer.
- 3. Some micro interactions will (and should) run in the background Whenever a user reaches the edge (or beyond) of a rule. This would be the case of an error about to occur. Ideally, this state would never occur, but it's sometimes necessary, such as when a user enters a wrong value (e.g., a password) into a field.
- 4. Another example is reaching the bottom of a scrolling list when there are no more items to display.
- 5. Whenever the system cannot execute a command. For instance, if the micro-interaction cannot send a message because the device is offline. One caveat to this is that multiple attempts to execute the command could occur before the feedback that something is amiss. It might take several tries to connect to a network, for example, and knowing this, you might wait to show an error message until after several attempts have been made.

 Showing progress on any critical process, particularly if that process will take a long time. If your microinteraction is about uploading or downloading, for example, it would be appropriate to estimate the duration of the process

Feedback could occur:

- 1. At the beginning or end of a process.
- 2. At the beginning or end of a mode or when switching between modes

1.1.4. Loops & Modes

Loops and modes are the last elements of micro-interactions. Loops determine how long the micro-interaction lasts. Take into account what happens when the user returns again and again. Long loops help extend your micro interaction so it changes and adapts over time.

The best reason to have a mode is when there is an infrequent action that would otherwise clutter the micro interaction's main purpose.

2. About Basava

Basava was a 12th century philosopher and saint who played a significant role in the cultural and religious history of the Indian state of Karnataka. He was a social reformer who challenged the traditional caste system and advocated for the equal treatment of all individuals regardless of their caste or social status.

Basava was born in a Brahmin family and was educated in traditional Hindu philosophy and theology. However, as he grew older, he became disillusioned with the caste system and the hypocrisy he saw in the religious leaders of his time. He began to preach a message of equality, devotion to God, and the importance of individual effort in spiritual pursuits. Basava's ideas gained traction and he soon attracted a large following of people from all walks of life. He established a centre for his movement in Kalyana, which became a hub for religious and philosophical discussion. Basava's teachings inspired a new religious movement, the Lingayatism, which emphasized the importance of personal devotion to God and the rejection of caste and class distinctions. Basava's teachings also had a profound impact on the social and political landscape of Karnataka. He encouraged people to reject the caste system and instead focus on their individual skills and abilities. This challenged the traditional power structures and resulted in a more equal and just society. In addition to his teachings, Basava also composed vachanas, which were short poems expressing his spiritual and philosophical ideas. These vachanas are considered to be some of the earliest examples of Kannada literature and continue to be popular and widely read today.

Basava was a visionary philosopher and saint who left a lasting impact on the people of Karnataka. His teachings of equality, devotion to God, and the importance of individual effort continue to inspire people to this day and have played a major role in shaping the cultural and religious identity of Karnataka.

3. Basava Vachanas

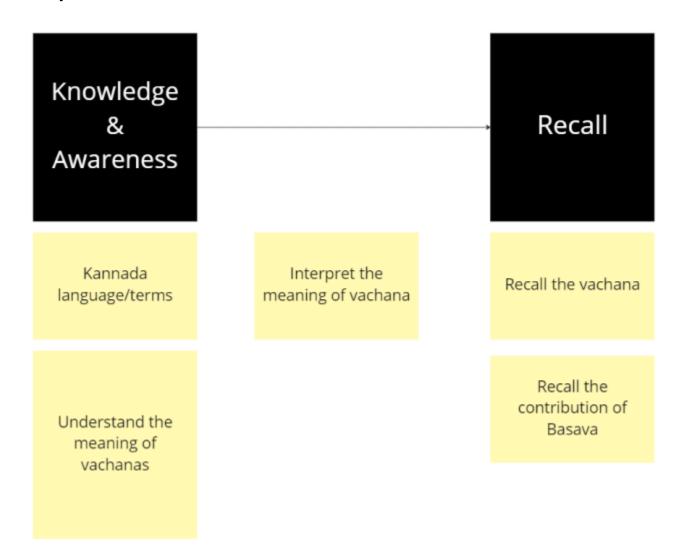
These poems are considered to be the foundation of the Lingayat philosophy and tradition and address a wide range of themes, including devotion, morality, social equality, and rejection of caste and gender-based discrimination. Basava Vachanas emphasizes the importance of individual spiritual experience and direct communication with the divine, and are considered to be some of the earliest forms of devotional poetry in Kannada language.

Vachanas' Broad Classification Generally speaking, there are two types of vachanas: experiential and explanatory.

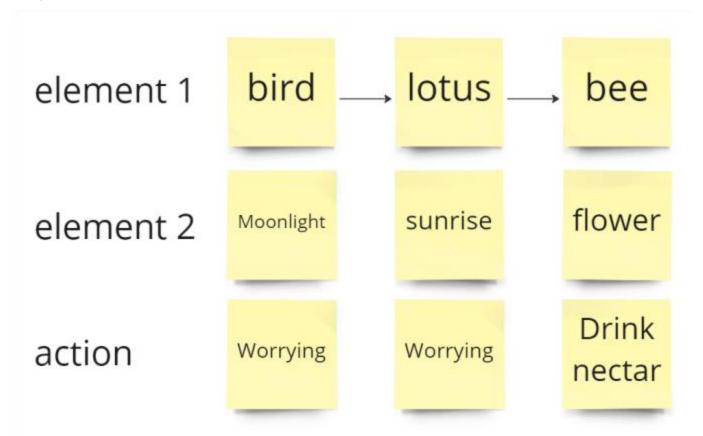
- a. Experiential: Metaphors and paradoxes are frequently used in experiential vachanas. These tropes also appear to reflect the concerned vachanakara's perspective. The reader is forced by the metaphorical vachanas to adopt a fresh perspective and create new connections between concepts.
- b. Explanatory: The explanatory vachanas include vachanas for the proposition, its denial, its justification, and its practice. Vachanas of proposition typically spread a certain moral perspective, a desired conduct, or a set of values.

The Vachana that has been chosen for representation is an experiential vachana.

4. Goal

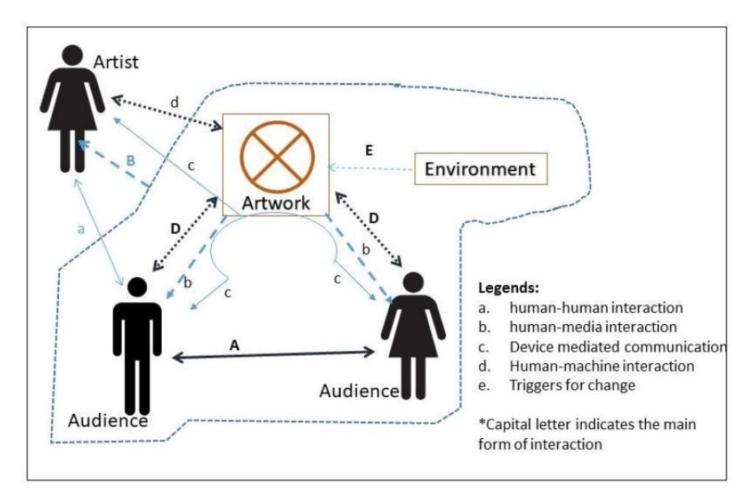


5. Elements



Types of interaction in a museum

6. Learnings from a museum



Interactions in a Digital Art installation. Source: Research Gate

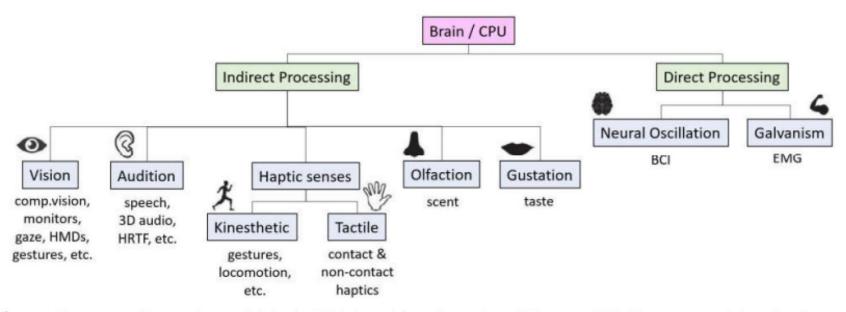


Figure 1. Taxonomy of interaction modalities for XR (adapted from Augstein and Neumayr [26]). The taxonomy is based on human senses and classifies both input and output devices and technologies for multimodal interaction.

7. Case studies

7.1 Ajanta

7.1.1 Exploring Ajanta

Being a valuable historical, artistic, and architectural monument, Ajanta Caves should be recognized and cherished by everyone. There is a multitude of information that is available on site, but is refrained to be spread across due to several gaps. The value that the site is offering was

- Location Accessibility:
 Traveling to the caves itself takes significant motivation, cost and effort for the potential users.
- 2. Accessing information within the site: The topography of the caves along with the area might make it difficult for the users to visit all the caves in a single day. The amount of time they can spend in a cave also becomes limited with respect to the quantum of information that is accessible. The caves are dark, and a lot of information in the form of shrines and paintings has experienced dilapidation due to various factors. The paintings and shrines can be viewed from a certain distance only, which can make it difficult for the user to view and understand them properly.
- Access to incorrect information:
 Users who visit the caves might have limited to no
 information about the caves, and the people who assist
 them (ie- local guides) themselves might lack

knowledge regarding the same, but they don't hesitate in spreading the false data as their livelihood is dependent on it.

Hence the primary initiative of the project is to transfer of right knowledge about Ajanta to the bigger set of crowds. This user type was vast and varied based on multiple variables including age group, prior knowledge about the caves, language etc. For the initial understanding met the team to gain the right kind of understanding about the project. The project has been going on for almost a decade and is continuously iterating to transfer the knowledge in the most feasible and effective way to the users. Installations:

- Padmapani & Vajrapani
- Material Culture
- Hariti Shrine
- Main Buddha Shrine
- Dancing Girl
- Medallion
- Explore Ajanta
- Mini Ajanta
- VR Exhibit of the caves
- Ajanta Virtual tour

The technology used for data collection: Photogrammetry has been used to capture the 3D coordinates, in this case defining a surface, to be derived from points within two 2D pictures that have been taken from slightly different positions using charge-coupled device (CCD) cameras.

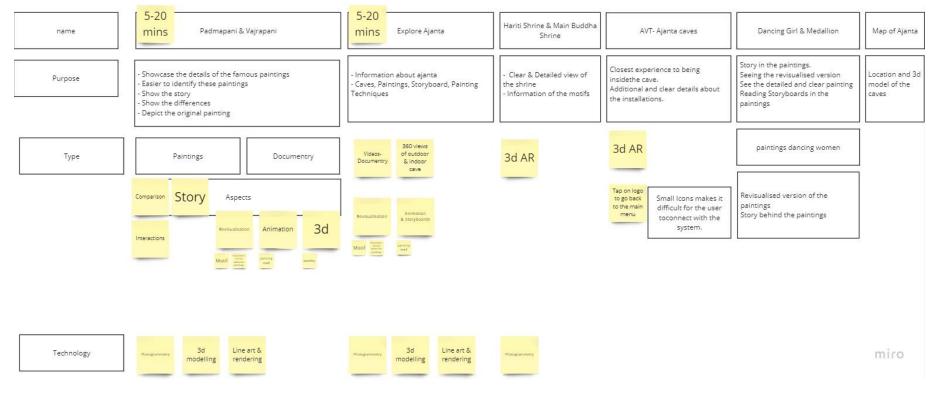
For Representation: Based on the purpose of the installation, different mediums or representations are used including,

Augmented Reality, Virtual Reality, 360-degree image, Touch based interaction with images, 3d models and animation, and Revisualization through images and line art.

7.1.2 Aim

My aim for this study was to understand and learn more about

- 1. Process followed, Representation of information collected, including the technology used in the Exhibition Space Design of Ajanta Caves.
- 2. The experience of the user attending this exhibition.



7.1.3 User study

Types of Users

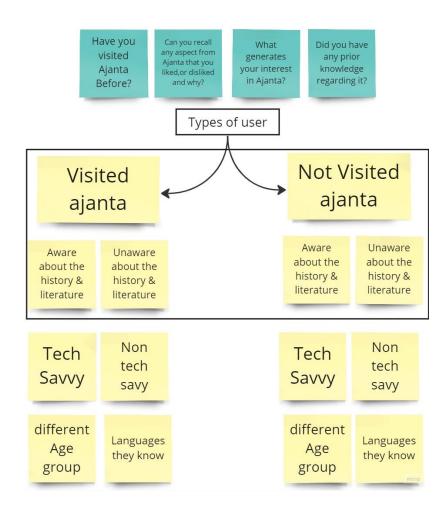
The users were identified different kinds and divided into multiple categories. 3 major stages were identified:

Documentation, Execution & Presentation. The Documentation stage is related to collection of data, the execution stage is connected to Free The variables were dependent on their visit to Ajanta, their prior knowledge about the caves, their comfort and knowledge about technology, age group, whether they were visiting alone or in a group. I also tried to identify the factors that different users might encounter in this scenario:

I tried to focus on the kind of information the user attains with respect to accuracy as compared with the installation, and the elements that contributed to the information. The fundamental questions that I wanted to understand were:

- 1. If the users are attaining the right kind of information?
- 2. Is the exhibit actually generating interest in users wanting to know more about the caves?
- 3. How much information are they able to retain?
- 4. What is the impact of technology to create interest, understand, remember and recall the facts?
- 5. What are they exploring on their own, and at what points do they need assistance?

The first set of questions was for the users who have visited Ajanta caves:



Visited ajanta caves

Have you visited AJanta before?

Did you take a guide or went by yourself? - Can you recall what you liked during your visit there? What motivated you to visit it? How many caves have you visited there?

When did you visit it?

Prior Awareness about the history & literature

How did you get to know of the stories there? Did you have any prior knowledge regarding it?

Can you recall any mythological storied regarding ajanta? Knowledge from exhibit Which installations did you like the most

What were your expectations before visiting the digital/virtual exhibit?

How did you find the experience of visiting the Ajanta digital/virtual exhibit?

- Takes them to the cave exerience, What did you like here?

What did you understand after visiting ajanta?

What did you like after going there?

What were you excited to see there before going?

Did you have any experience with any technology? -Which experience will you take Which experience will you take

- Do you think there are any flaws Did you face any challenges during your visit to Ajanta Caves in person or virtually? If so, what were they?

How did the interpretation and presentation of the Ajanta Caves in person or virtually impact your experience? How do you think the Ajanta Caves in person or virtually could be improved for future visitors?

Would you recommend visiting the Ajanta Caves in person or virtually to others? Why or why not? Why are you visiting the exhibition again

What did you recommend from this exhibition to your aquaintances Who did they bring aalong with them?

Did people come from recommendation? What was reommended?

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7.1.4 Insights

- Enhanced understanding of the details:
 The virtual experience of the Ajanta Museum offered additional information about the history and culture of the Ajanta Caves which was not available during a previous in-person visit. This can enhance visitors' understanding and appreciation of the site. Due to the closeup and clear details offered by the virtual experience, the understanding of the caves broadened and got more nuanced.
- The users did not use the tablet to access the exhibits like Padmapani & Vajrapni or material culture, hence they were not able to access help/tutorial for that exhibit. Hence, they were not able to access or locate different indifferent buttons or categories right away
- Newer technologies like VR tours of the caves generated a significant amount of interest in getting the users' attention of all age groups. The users visited again and recommended this exhibit to their acquaintances.
- 4. For the users who had significant knowledge of the caves were more interested in exploring the exhibits with more information, like revisualization, documentary, & written information, and storyboarding.

- 5. Signage: The locations of the signage make it difficult for the user to notice them. 360-degree view of the caves.
- 6. Information box and information icon: Clicking on "i" button is difficult for the user. When the interactive boxes overlap, it becomes difficult for the user to click on the icon.
- 7. In the Ajanta Virtual Tour exhibit, The size of icons of "O- Outside" "S- Shrine" and" H- Hall" are small in size and it becomes difficult for the user to click on them.
- 8. The common and frequently used gestures made it easier for the users to interact with different exhibits. The gestures that were different between interactive screens, 360-degree output and AR exhibits confused the users.
- 9. Users were observed to get confused regarding access & navigation and gestures with different technology following similar output in the exhibit. The AR shrine and AVT had a 360-degree view of the exhibit. The users tried to follow going near the image in order to zoom in on the AVT exhibit unless conveyed otherwise. Similarly, users would try to pinch in order to zoom into the AR exhibit.
- 10. Documentary at the beginning/ as a screensaver intuitively conveys to the user that the screen might not be interactive. Users faced issues with respect to navigation and knowing the full list of features in material culture. Navigation was also an issue due to the extended spacing between the icons.

- 11. Users didn't like the rotation of the 3d model, they wanted gestures to control it
- 12. There was an anomaly wrt to intuitiveness when it came to certain gestures in material culture.







7.1.5 Learnings

 Users can get confused and are not aware about the kind of technology. Common Gestures make it easier for the users to interact with the exhibit better

Tap

- Primary interaction to access information on the screen
 - Used for selection or to choose a category - to go back

Swipe Left right up down

- To see line drawings, re- visualisations, to acess different views
 - Pan view

Pinch in and out

- Zoom in and out

2. Technology: I got to know about the technology like photogrammeter, and I got insights on the extent of VR and AR. The learning was understanding the extent of the technology in delivering the right goal expected

- from the experience. Technology is only a tool, but delivering the experience is of primary importance.
- Just experiencing the scope virtual exhibit made me understand the vast possibilities that a virtual exhibit has, and in Basava experiential exhibit I tried to incorporate these learnings.
- 4. I got to know that Users get more engaged in the exhibit, and want to explore more, explore if the technology is new to the user. This was followed throughout all age groups. The users were also able to do more retention of information and were able to recall it when recommending the exhibit to others. They got more curious and discussions started happening. This is unlike the conventional physical exhibition, where users go for the sake of it.
- 5. Since multiple teams at different times were working on the project, there were some differences pointed out by the user in revisualization and the 3d of the Pandmapani exhibit.
- 6. In order to avoid crowding, the goals of an exhibit should not be many. If we try to provide all the information in a single space, then it will lead to crowding in a single space.
- 7. The information architecture, should be simple, wellorganized and easy to understand. Breadcrumbs help
 the users in understanding where they are. Buttons for
 interactions should be located in a zone that is easily
 detected by the users. Feedback and help at all times is
 a must, especially f technology is new to the user.
 Including tooltips or pop-ups with additional

information about the exhibit or how to use the interface.

7.1.6 Limitation

The user age group was not identified. The documentation could have been done in a more detailed manner.

8. Gombe Atta

Gombe Aata is a traditional form of puppet theater that is performed in the state of Karnataka in India. It is a popular form of entertainment and has been an important part of the local culture for many years. The puppets used in Gombe Aata are usually made of wood & leather and are operated by strings. Performances usually involve music, dance, and storytelling, and they can be enjoyed by people of all ages. Gombe Aata is a great example of the rich cultural heritage of Karnataka and continues to be an important part of the state's cultural identity.

The elements of Gombe Aata (play of dolls or puppet show) typically include:

- Puppets: The puppets used in Gombe Aata are typically carved from wood and are intricately decorated. They are usually painted in bright colors and dressed in traditional costumes.
- Music: Music is an important element of Gombe Aata performances, and traditional musical instruments such as the maddale and the tambourine are often used.
- Dance: Dance is also an important part of Gombe Aata performances, and the puppets are usually made to dance along with the music.
- 4. Storytelling: Gombe Aata performances typically involve a story that is told through the movements and interactions of the puppets. The stories are usually drawn from Hindu mythology or from regional folklore.

- 5. Lighting: Lighting is used to create mood and enhance the visual impact of the performance.
- 6. Narration: A narrator is often used to provide background information and commentary on the story as it is being performed.
- 7. Background scenery: A backdrop is used to provide a visual setting for the performance, and props and other stage elements may also be used to help set the scene.

These are the main elements of Gombe Aata, and they combine to create a unique and entertaining form of puppet theater that is beloved by audiences in Karnataka.

Regenerate response





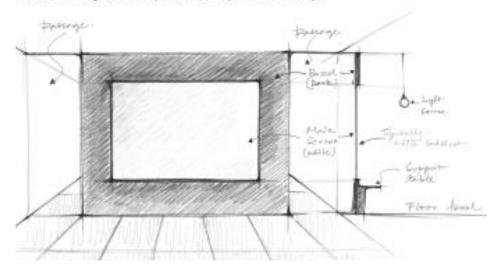
3d puppet of Ravana (Demon King) puppet used in Ramayana puppet show. source: D Source







2d shadow Togalu Gombeyaata puppetry with Gundu Raju



DESIGN WITH FIXED LIMBS (SHADOW PUPPET SHOW)



DESIGN WITH MOVING LIMBS (PUPPET SHOW)







Ornamentation is done in all the animals to represent their exquisiteness





Type of eyes





Forehand is always in view and the left & right palm are not mirror to each other





Foot is always in isometric perspective, and the left & right foot are not mirror to each other







Similar patterns in the head gear



Females have braided hair



Indian weapons have been depicted



The difference between old age and young age is created by the use of mustach and dark circle line below the eyes

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9. Concept of Shatsthala

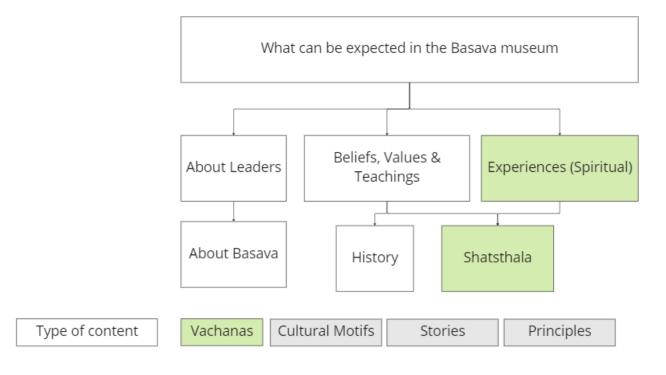
Shatsthala is a concept in Lingayat philosophy that refers to the six stages of spiritual evolution that a person must go through to attain salvation or liberation (moksha). The word "Shatsthala" literally means "six stages" in the Kannada language.

- Bhakta: Bhaktasthala involves the worship of Guru, Linga and Jangama. When one understands the true meaning of this Sthala, one conceives the true meaning of the trinity of Guru, Linga and Jangama. Through this Sthala one becomes free from the desires of the body and mind and becomes a Bhakta by virtue of his/her belief in Shiva.
- 2. Mahesha: Maheshasthala involves the actual practice of the above concept, which enables one to lose the desire for material wealth, not coveting and not longing for unrighteous sensual pleasures.
- 3. Prasadi: Prasaadisthala states that all things in this world are gifts of Shiva and whatever human receives as God's gifts must be returned to him through the intermediacy of the Jangama, who represents Shiva.
- 4. Pranalingi: Pranalingisthala makes one aware of the inner being. Here the seeker comes to believe that the Linga is the Jangama and all actions are transformed into prayers.
- Sharana: Sharanasthala endows an individual with the feeling and knowledge of God's presence in his/her own soul and begins a direct dialogue with Shiva.

6. Aikya: Aikyasthala forms the final stage. A stage of the culmination of the sublime achievement. It is the unitary consciousness of the Self and Shiva.

10. Goal of the project

The user goal of the project is to create an exhibit that provides a multi-sensory experience to help the user understand and experience a part of or get a glimpse of the 6 stages of Lingayat. The exhibition will use a variety of visual elements to enhance the user's experience and incorporate aspects of technology such as AR, VR, haptic feedback, sound, 360 sound, and olfactory stimuli. The project aims to immerse the user in an interactive and engaging experience that will help them gain a deeper understanding of the Lingayat culture and beliefs.



Type of Learnings at the museum

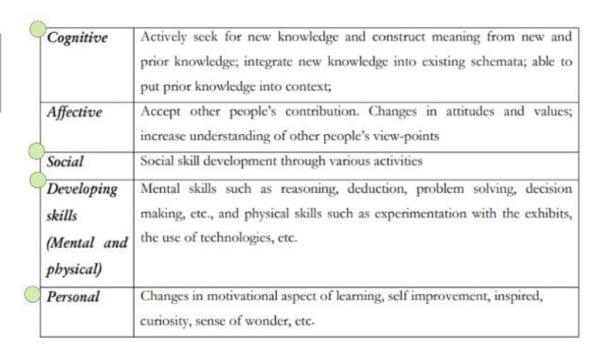


Table 2.1: Learning in a Museum (adapted from Gammon, 2003)

What is needed for the communication of the exhibit to be effective?

How can the exhibit establish emotional relevance and resonance with the user?

How can the exhibit to be effective?

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Wisual Auditory olfactory Haptic

What kind of users will be visiting the museum

Age

Gender

Education Level Language Proficiency Geographic Location

Cultural Background Motivations for Visiting

Accessibility Needs Technological Proficiency

Devout follower This user is a devout follower of the Lingayat religion, which originated in Karnataka. They are interested in learning more about the life and teachings of Basava. They are likely to be familiar with the religious rituals, beliefs, and practices associated with Lingayat, and they may visit the museum to deepen their knowledge of their faith.

History buff This user is interested in history and culture and is curious to learn about the life and times of Basava, who lived in the 12th century. They are likely to be interested in the social, political, and cultural context in which Basava lived and may visit the museum to learn more about the historical significance of his teachings and their impact on society.

Art and literature enthusiast

This user is interested in the art, literature, and poetry associated with the Lingayat religion. They may visit the museum to explore the artistic and literary traditions associated with the Lingayat community, including the vachanas, associated with Basava and his followers.

Tourist

This user is a traveler who is visiting the region and is interested in exploring the local culture and history. They may visit the museum as part of their itinerary to learn more about the cultural and historical significance of Basava and Lingayat. They are interested in the spiritual journey of shatsthala, and want to understand its relavance in the presentday context.

Student or researcher

This user is a student or researcher who is interested in the history, culture, and literature of Karnataka. They may visit the museum to conduct research or to deepen their understanding of the Lingayat community and its contribution to the cultural and literary heritage of the region.

user 1

Age Group: 30-50 years Gender: Female Level of Awareness: Intermediate Tech Savvy: Moderate Languages Known: English

tourist

Understand the significance and impact of Basava, Lingayat, Vachanas, and Shatsthala on the spiritual journey

Experience a deeper connection with the spiritual teachings.

Explore the history and evolution of the Lingayat faith.

Connect with other spiritual seekers and build a sense of community

Thinks

I want to experience a deeper understanding of Basava, Lingayat in a way that engages my senses and emotions.

I hope to connect with other like-minded individuals who are on a spiritual journey and build a sense of community

I want to understand the history and evolution of the Lingayat faith and how it relates to modern life

I am interested in exploring the impact of spiritual teachings on personal growth and development

Does

Explores the exhibit with an open mind and a willingness to learn and grow

Engages with other visitors and museum staff to share insights and perspectives on the teachings and their impact

Reflects on personal experiences and insights gained from the exhibit to deepen their understanding of the spiritual journey

Needs

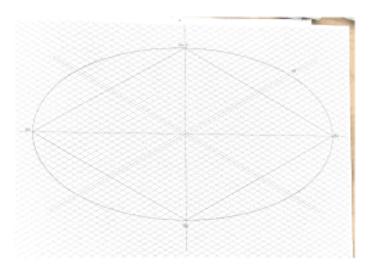
A variety of multi-sensory elements that cater to different learning styles and preferences

Accessible information and resources that allow me to learn at my own pace

A safe and welcoming environment that promotes open dialogue and mutual respect among visitors

11. Ideation

11.1 360-degree storyboarding grid



The 360-degree storyboarding grid is typically divided into several sections, each representing a different view or angle in the 360-degree environment. The exact number of sections can vary, but a common division is into 8 equal parts or "wedges". Each wedge represents a 45-degree viewing angle. In this division, each wedge is labeled with a compass direction (e.g. N, NE, E, SE, S, SW, W, NW) to indicate the general direction that the viewer will be facing in that section of the grid. This helps filmmakers and animators to plan their shots and camera angles in a way that makes sense in the 360-degree environment.

The 360-degree storyboarding grid is a flexible tool, and the number of sections and the exact angles can be adjusted to meet the specific needs of the project. However, the overall goal is to provide a visual representation of the 360-degree environment that can be used to plan and organize the shots and camera angles for a seamless and engaging experience for the viewer.

11.2 Gestures- AR (Phones and Tablets)

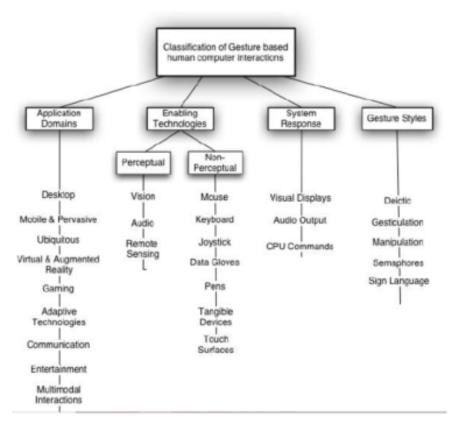


fig: Visualizing the taxonomy: The diagram shows the organization of the research on gestures based on the four categories used in the taxonomy. One thing to note with this taxonomy is that it can be rearranged based on the perspective of the research or researcher. For example if we are coming from the perspective of doing interaction research within a particular domain, then our input and output and gesture choices for the interaction are restricted by what is appropriate or available within the constraints of that domain. The diagram represents the classification of the gesture based human computer interaction literature reviewed for the taxonomy

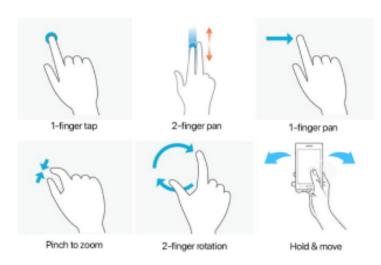
source: A taxonomy of Gestures in Human Computer Interaction

The taxonomy of gestures in Augmented Reality (AR) for tablets and smartphones is a subset of the overall taxonomy of AR gestures, with a focus on gestures that are specific to these types of devices. Some common categories of gestures for AR on tablets and smartphones include:

- Touch gestures: These gestures involve tapping, tapping and holding, and swipe gestures on the screen of the device to interact with virtual objects and the AR environment.
- Motion gestures: These gestures involve tilting, shaking, or rotating the device to interact with virtual objects and the AR environment.
- Multi-finger gestures: These gestures involve using multiple fingers on the screen of the device to interact with virtual objects and the AR environment, such as using two fingers to zoom in or out.
- Voice commands: These gestures involve using spoken commands to interact with virtual objects and the AR environment.
- Posture-based gestures: These gestures involve using the position or orientation of the device to initiate an action in the AR environment, such as holding the device vertically to view a full-screen video.

These categories are not mutually exclusive, and many AR apps for tablets and smartphones utilize a combination of different gesture types for a more intuitive and immersive user experience. The taxonomy of gestures for AR on tablets and smartphones is constantly evolving as new technologies and interaction methods are developed, and it is likely that new categories and subcategories will emerge over time.

Touch Gestures



The most intuitive touch gestures in phone-based Augmented Reality (AR) are those that closely mimic familiar physical actions and are easily understood by users. Some of the most intuitive touch gestures in AR on phones include:

- Tap: This gesture involves tapping the screen to select an object or initiate an action in the AR environment.
- Swipe: This gesture involves moving a finger in a horizontal or vertical direction on the screen to navigate through the AR environment or interact with virtual objects.
- Pinch: This gesture involves using two fingers to pinch or zoom in or out on virtual objects or the AR environment.
- Drag: This gesture involves touching and holding an object on the screen and moving the finger to move the object within the AR environment.
- Long press: This gesture involves tapping and holding an object on the screen for a specified amount of time to initiate an action or access additional options.

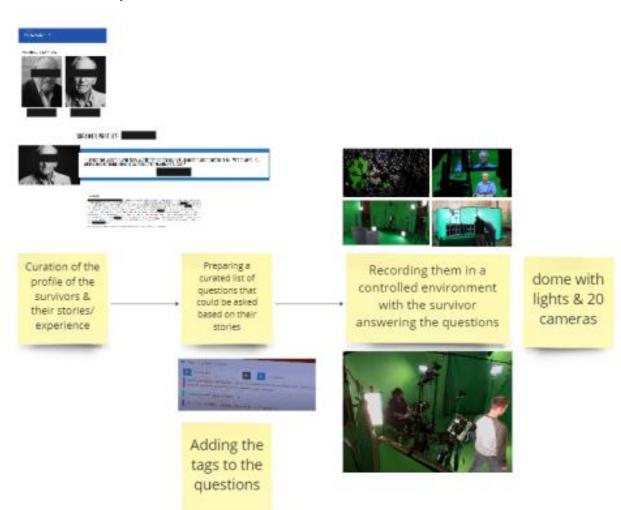
Motion Gestures

Some common motion gestures in AR include:

- Tilt: This gesture involves tilting the tablet in a specific direction to initiate an action or move virtual objects within the AR environment.
- Shake: This gesture involves shaking the tablet to initiate an action or change the perspective of the AR environment.
- Rotate: This gesture involves rotating the tablet to change the orientation of virtual objects or the AR environment.
- Motion tracking: This gesture involves using the tablet's built-in motion tracking technology, such as accelerometers and gyroscopes, to track the tablet's movements and translate them into actions within the AR environment.

By using these types of motion gestures, AR apps for tablets can provide a more immersive and interactive experience for users, allowing them to interact with virtual objects and the AR environment in a more intuitive and natural way.

11.3 Interactive hologram: Survivor stories experience



In this museum, the holocaust survivors are projected as holograms. To execute the task, they were were asked around 2000 questions and it was carefully recorded.









Documentry

to show the life & experience of the survivors at that point of time Hologram

To answer questions from the audience post the documentry

11.4 Mori Building Digital Art Museum, Japan

The light that serves as teamLab's pigment for Borderless comes primarily in the form of projection. A total of 524 Epson projectors, including those held in reserve, are used across the Mori Building to bring approximately 60 works of art to life. The projectors include Epson EB-L1105U units, EB-L1505UH high brightness units, EB-700U ultra-short throw units as well as a variety of different lenses.







11.5 Uiryeong Museum



11.6 Fluidic sculpture in Motion

Fluidic Sculpture is a design philosophy that was first introduced by Hyundai Motor Company in the late 1990s. The term refers to a style of automobile design that emphasizes flowing, organic lines and a harmonious balance between form and function. The focus is on creating a seamless, aerodynamic look for the car that conveys a sense of movement, even when the car is stationary. The term "In Motion" refers to the idea that the design of the car should evoke a sense of fluidity and motion, even when the car is not actually moving. This design philosophy has since been adopted by many other automobile manufacturers and has become a hallmark of modern automotive design.



12. Concepts

12.1 Concept 1:

Goal: Make the user understand the elements and the meaning of the vachana. Help them experience the aspect of spirituality.

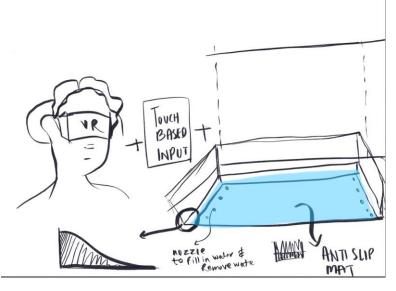
Technology:

Virtual Reality+ Physical Space

The user will enter this space and put in the VR glasses along with the touch-based input. The addition of water will give additional haptic feedback to the user.

Apart from the sound of the vachana music, the sound of the elements in it like the bird, water, wind, and bee is included.

Senses: Visual, Sound, Haptic Learning: Personal and Cognitive



Scene:

The users will view this first. A dark environment is a depiction of entering a calm space. This represents entering stage 1, into learning the true meaning of a power/divinity that is beyond us.





The partridge bird worries about moonlight. The bird will fly and enter. 360 sound of a bird flying will grasp the user's attention and they will witness the bird entering the space and sitting on the rock. This is when the vachana will start.

The lotus flower, worries about the sunrise. The user the moves towards a comparatively brighter space,

of the dawn. The lotus from silhouette in the background is now floating towards the center, for this the user will be looking at the bottom because the lotus is at their feet. Haptic feedback will be provided from the water that the user is standing on.

The bee only worries, about drinking fragrant nectar.



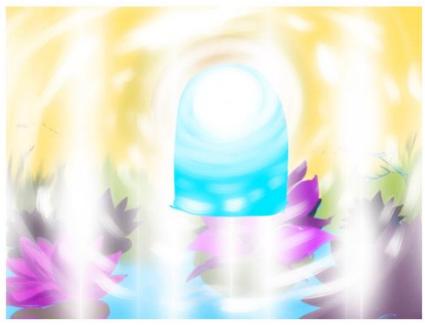


The user will then hear the sound of the bee coming from a distance, and user will be able to see the bee. The bee will buzz and follow the random trail in order to look for the nectar, and will eventually land on the lotus. The background will become brighter, signifying that the user is near to the final stage.

My only worry is to be, reminiscing about you, Oh my lord of Kudala sangama!









The screen will transform into a plain white space eventually and the shivaling will appear from the empty space. At this stage the water will drain out, signifying the end of the vachana, and also the merging of extreme emotions with the divine, creating a calm environment.

12.2 Concept 2

Goal: Make the user understand the elements and the meaning of the vachana. Help them experience the aspect of spirituality.

Space: Interactive Exhibit on the walls. It will be a projection mapping technique used for the Van Gogh exhibit and digital art museum in Japan created by the Japanese collective team lab. Sensors can be used to make the space more interactive for the users.

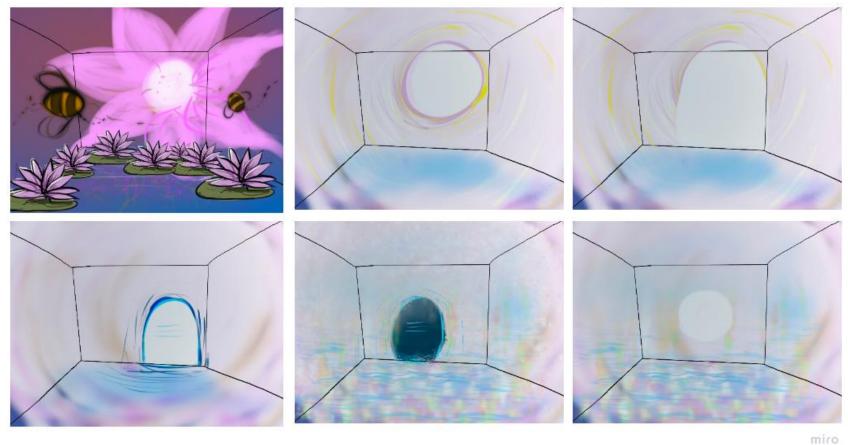
Technology: Multiple Projectors placed at the top, Mist generating device, Ambient scent of wood, Lotus, and day flowers. 360-degree sound of trees swooshing, water, bird, wind, and bees.

Senses: Visual, Sound, Haptic, Olfactory Learning: Personal and Cognitive, Social, Developing

The central wall will be used to display the main activities. The entry and exit of elements will happen from the sides of the wall. Based on the user's position of standing and movement the water, lotus and the bees will move.







The exhibit will end as a white dot on the screen, showcasing that the human is now one with the divine. In the end, there will be no sensory stimulus.

12.3 Concept 3

Goal: Help users learn about the growth of the human through different stages. It is more focused on conveying the aspects of spiritual experiences rather than the vachanas.

Tech: Mist, sound, and anechoic chamber design at the final stage (anti-echo chamber)

Senses: Visual, Sound, Haptic, Olfactory

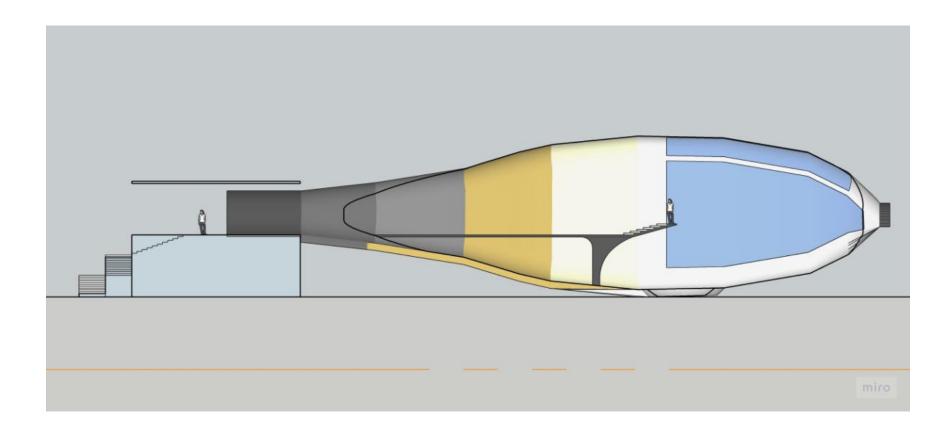
Learning: Personal and Cognitive, Social, Developing

It will be a physical space entirely.

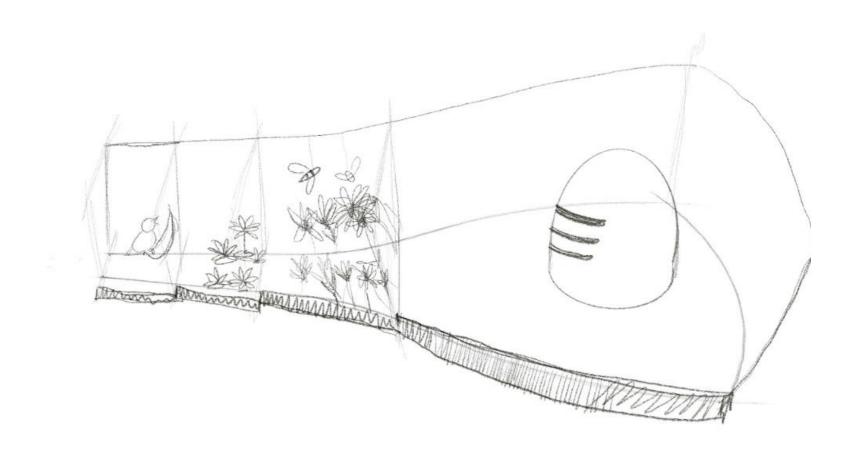
Moving from a small constricted space, showcasing that humans move from viewing the world, from his perspective, thinking and doing things only for themselves, to being part of a bigger picture of the universe.

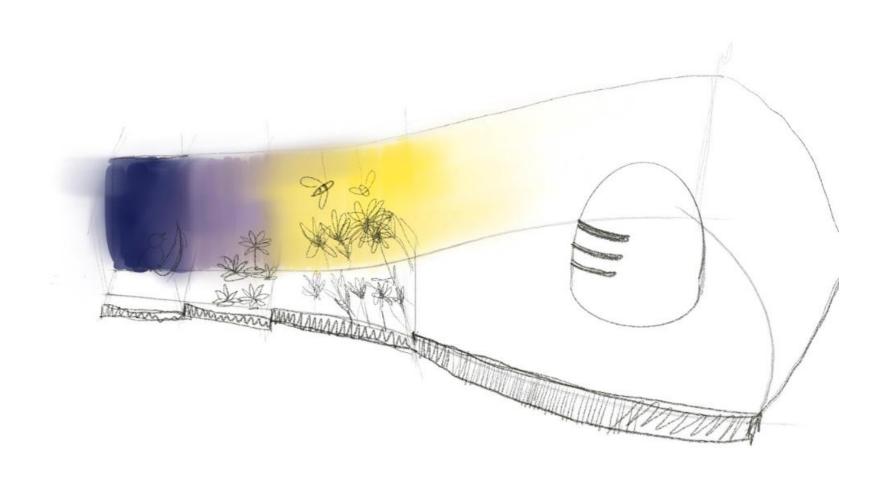
It is aimed to show the progression, and the letting go of ideas that constrict the user to only think about themselves the material things in life. The elements of the vachana will help the user in constricting conveying this idea to the user.

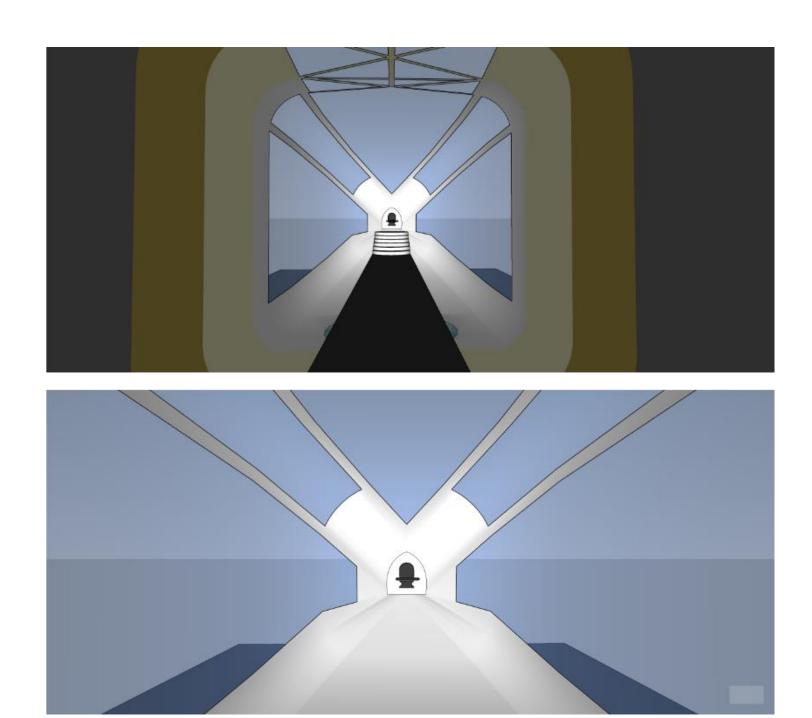
The space at the beginning is dark, edgy and rugged. And at the end, it is flowy and not confined, yet confined to the universe.



Smell 216417 Day agus WIDE OALL) OPEN COMPACT I Hely 1 Danker color CANTILEVER RAMP (FLAT) Brigget STAKIS W/ CIVING THE
SENSE OF BEIND
IN THE CENTER OF WARRIES > PROGRESSES TO A COUGH FLOOR SMOOTH FLOOR BEING ON THE GROUND-







12.4 Concept 4

Shadow puppet Gombe Atta

