Crafting Narratives

Real- Time Generative Storytelling through Tangible AI

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Abstract

Through prototyping and experimentation, this thesis investigates the affordances of tangible AI objects as user interfaces to enhance user engagement in the context of a narrative environment. Leveraging AI/ML tools, the objective of the research is to investigate how generative AI can be applied in unconventional contexts, allowing users to co-create with Generative AI models, unfolding narratives in real-time. The envisioned outcome as an interactive installation encourages users to explore, experiment, control and co-create along with generative AI models. This hands-on approach through an installation merging generative storytelling and physical-digital artefacts, aspires to serve as a bridge between the apprehensions surrounding AI and its meaningful integration, shifting the discourse to informed curiosity. The project invites users to be a part of the conversation, encourages critical engagement, and allows users to assess AI's potential within their own realms.

Keywords:

human-computer interaction, human-AI interaction, tangible user interface, user experience design, generative storytelling, artificial intelligence, tangible artificial intelligence, machine learning, spatial computing, mixed reality, interactive installation

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Dedication

To my family and friends: I express gratitude to Amma and Appa, for their constant support and encouragement to move to Canada in pursuit of what I've always wanted to do, and my little sister who is soon to become a master's degree holder herself! And my partner Jo, my personal cheerleader, thank you for being patient and supportive through this journey! And ofcourse, my friends Kj, Maaj for keeping me up to date with the endless gossip. It felt like I never left home!

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Table of Contents

List of Images & Tables

Chapter One: Introduction

1.1 About the Research

Image 1.1 : Final Installation, User engaging with the installation and co-creating with AI

This research project investigates the potential of Tangible User Interfaces (TUI) and Generative Artificial Intelligence (Gen AI) as an installation that engages the Gond Tribe's Creation Myth as an interactive storytelling experience. It explores the creation of real-time generative visuals, using tangible objects as interfaces. These visuals are used in the creation of the scenes, navigating through and unfolding the Gond Creation Myth narrative. The intent of this research project is to bridge the technological gap between users and generative AI models through storytelling as a medium, leading to valuable insights on how tangible objects can be integrated with technology to create engaging user experiences. This project also investigates and explores the various aspects of generative AI in the context of Human-Artificial

Intelligence collaborative storytelling. The generative nature of the storytelling process leaves room for ambiguity and multiple interpretations, sparking thought and a scope for discussions among the users. This creates a pathway to start conversations around the growing fear surrounding AI, encouraging users to explore the potential of generative AI tools beyond the conventional applications.

The research methodology implemented in this project is Research Creation (Chapman & Sawchuk, 2012). The approach through the design process is non-linear; alongside the creation of the design through iterative prototyping, critical literature and contextual review, the research explores three key themes: 1) Tangible objects as interfaces, 2) Storytelling as a Medium and 3) Generative AI as a tool for co-creation and collaboration. Juxtaposing theory and creation, this research investigates frameworks for understanding how themes of generative AI and tangible objects act as interfaces in the context of a real-time storytelling environment. This aided in the creation of engaging user experiences that encouraged users to critically engage with AI.

The research project's outcome is presented as an interactive installation combining physical and digital elements. The viewers are invited to interact with the tangible objects, co-creating and building the scenes alongside a generative AI pipeline, unveiling the Gond tribe's creation myth narrative. The use of storytelling techniques through the creation myth narrative structure aid in exploring the potential of digital media; offering interactive, participatory modes of engaging users with the narrative which creates a scope for reviving some aspects of communal storytelling. This interactive physical-digital environment creates a space for viewers to collaborate and explore the capacity of generative AI tools. The prototypes developed within the scope of the thesis project focus on exploring different mediums, materials and tools that demonstrate the potential of using tangible AI in a real-time generative storytelling experience. The final exhibition is an amalgamation of the 3 prototypes

built and tested during the research; Tangible Objects in collaboration with Generative AI for scene building, Morphing Generations: Dynamic animation exploration, and Exploring Sound feedback: Integrating Sound into Interactive Environments. The intent is to is to encourage users to experiment and collaborate with generative AI, enabling hands-on user interaction. Overall, the installation also creates opportunities for utilizing generative AI tools in unconventional contexts, thereby pushing the boundaries of these technologies.

1.2 Establishing the Context for Research

In today's digital landscape, the integration of artificial intelligence (AI) into systems has become increasingly common. This integration of artificial intelligence is well known in voice assistant technologies, self-driving cars, facial recognition, and medical applications (Poole & Mackworth, 2023). Generative artificial intelligence (AI) has also become a significant area of research, bringing about transformative advancements across multiple fields, including computer vision, natural language processing, and creative arts (Bandi et al., 2023). Generative AI showcases potential, opening up new avenues for applications such as image synthesis, text generation, music composition, and even human-like chatbots (Zhang et al., 2023). However, despite facing criticism regarding risks, biases, and ethics (Hibbard, 2014); it is essential to investigate the possibilities of how these emerging tools can be viewed as an asset and be applied beyond the conventional applications.

In Melanie Mitchell's "Artificial Intelligence: A Guide for Thinking Humans", the author informatively explores the complexities and promises of Artificial Intelligence (AI). In the "Trustworthy and Ethical AI" chapter of the book, the author emphasizes the need for a collaborative and interdisciplinary approach to develop effective and responsible AI regulation and states the following;

> Given the risks of AI technologies, many practitioners of AI, myself included, are in favour of some kind of regulation. But the regulation shouldn't be left solely in the hands of AI researchers and companies. The problems surrounding AI – trustworthiness, explainability, bias, vulnerability to attack and morality of use – are social and political issues as much as they are technical ones. Thus, it is essential that the discussion around these issues include people with different perspectives and backgrounds. Simply leaving regulation up to AI practitioners would be as unwise as leaving it solely up to government agencies. (Mitchell et al., 2020, p.124)

Artificial intelligence models are complex and difficult to interpret, making it challenging to understand how and why they generate specific outputs. In Pasquinelli and Joler's "The Nooscope manifested: AI as instrument of knowledge extractivism," the authors discuss the social origins of machine learning intelligence; explainability of the factors that go into training data sets is crucial to understanding the advancements in models and learning algorithms (Pasquinelli & Joler, 2020). The authors called the AI algorithms and models "black boxes", as understanding how these models work is far-fetched. It is impossible to decode why models make certain decisions (Pasquinelli & Joler, 2020). This lack of explainability hinders their adoption in various disciplines where transparency is essential.

While considering the role of AI in our society, it is essential to address the benefits of AI systems that help in day-to-day services and improving people's lives. Some examples of AI technology central to services include speech transcription, language translation, GPS navigation, music recommendation and optimization of energy use in buildings (Mitchell et al., 2020, p.118). Looking at the application of AI in creative fields, some of the models that help users in developing creative projects are image generation, creative editing, content development and image

manipulation (Bandi et al., 2023). Beyond the current applications in other fields such as data sciences, inclusive design and education, various models showcase an increasing potential in improving models of climate change, medical systems and problem solving (Mitchell et al., 2020, p.118). According to Demis Hassabis, the cofounder of Google's DeepMind group, this is the most important advancements and benefits of AI:

> We might have to come to the sobering realization that even with the smartest set of humans on the planet working on these problems, these [problems] may be so complex that it's difficult for individual humans and scientific experts to have the time they need in their lifetimes to even innovate and advance.... It's my belief we're going to need some assistance and I think AI is the solution to that. (Palmer & Hassabis, 2015)

This thesis project is an extension of this idea of looking at potential benefits of AI and contributes to the fields of Human-Computer Interaction (HCI), Human-centered AI (HCAI), Tangible User Interface (TUI), Artificial Intelligence, and Generative Storytelling. 'Crafting Narratives' is an interactive installation integrating Generative AI for users to co-create and engage in a real-time narrative environment through tangible objects as interfaces. In response to the increasing critique of the technologically driven world, I believe and hope to push the boundaries by which people respond to AI technology. By facilitating hands-on user engagement, the installation creates a scope of applying these generative AI tools in an unconventional context, pushing the capabilities of such technologies. Furthermore, the purpose is to leave the users experimenting and co-creating with the generative AI; contributing to a deeper understanding of how these technologies can be harnessed for practical use.

1.3 Research Questions

Primary Research Question

How can tangible AI objects act as collaborative interfaces for users to co-create with and create new forms of generative storytelling?

Secondary Research Question(s)

How can the use of tangible AI objects as collaborative interfaces and generative AI as a storytelling tool contribute to a shift in the discourse surrounding AI, promoting informed curiosity, critical engagement, and user agency in narrative creation?

How can Generative AI act as non-linear storytelling tool and enhance the process of real-time content creation for a storytelling environment?

How can the affordance of the tangible objects enhance user engagement with the narrative in the real-time generative storytelling environment?

1.4 The Creation Myth Narrative

Creation myths are universal narratives that are timeless and signify the origin of the universe, values of existence and the purpose of life. Based on the origin, these stories reflect strong cultural values, belief systems, and understandings of the world based on approaches held by communities across the globe. Furthermore, the diversity of creation myths from cultures allows individuals to understand the various worldviews through the lens of diverse cultures. It is interesting as this comparison of their versions of the creation myth can contribute to sharing of their wisdom from one generation to the next. In Joseph Campbell's "The Historical Development of Mythology", the author delves into a "comparative approach" (Campbell, 1959) for

cross-cultural analysis to understanding myths from diverse cultures to identify common themes, motifs, and patterns. He believed that studying these similarities could offer insights into the universal human experience and the psychological functions of mythology. Although Campbell's work is central to Western Mythological traditions, the concept of cross-cultural analysis helps in understanding the shared identity of a community and reflects its cultural origins.

1.5 The Gond Tribe's Creation Story

The Gonds, the largest Adivasi Community in Central India are of Dravidian origin (ethnolinguistic group of ethnic groups native to South Asia) and can be traced to the pre-Aryan era. The origin of the word Gond is derived from the Kond; Kond in the Dravidian idiom means green mountains. Gonds are organically connected with nature, and they called themselves Koi or Koiture[1]. The people of this community were often called Gond since they lived in the green mountains. In ancient times, the Gond Tribe, once a part of the vast community, shared their version of the creation myth. This myth is rooted in animist philosophy, as they are the people of the green mountains. Their version unveils the mysteries of existence in a very interesting manner. As one of India's largest and oldest tribes, their tale is a captivating journey into the creation of the world. The tribe spread across expansive lands in Central India, share their spiritual connection to the forest through oral storytelling was passed on over generations.

According to the Gond's, A nameless creator who they named Baba Deo or Mahadeo, sits on a lotus leaf envisioning the creation of the world[2]. The creator realizes the need for clay, collects the congealed dirt from his chest and forms a crow, sending the crow on an expedition to acquire clay for creating the world. The crow

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1 Ministry of Culture, Government of India. (n.d.). The Gond of Madhya Pradesh | ignca. https://ignca.gov.in/divisionss/janapada-sampada/tribal-art-culture/adivasi-art-culture/the-gond-of-madhya-pradesh/

2 Hashmi, S. (2009, June 19). Habib Tanveer and the Gond myth of Creation. KAFILA. https://kafila.online/2009/06/19/habib-tanveer-and-the-gond-myth-of-creation/

grows tired after an endless search flying over a large body of water. The crow lands on the claw of a crab (called Kekda Mal) peeping out of the water, mistaking it for a stump. The crow began telling the crab his tale of woe. The crow said he could not go back without clay because the creator asked him to get some to create the world, but there was nothing but water all around. The crab informs the crow that the clay is consumed by the earthworm in the netherworld. The crab assures the crow that he will help retrieve the clay. The crab goes under water and confronts the earthworm asking him to give him clay. The earthworm refuses to give the clay, claiming clay as its food. The crab grabs the earthworm and returns to the surface of the water. The crab squeezes the earthworm and demands it to spit out the clay. The crow grabs the clay and flies back to bring it to the creator. The creator lays out a thin sheet of clay on the water. The water was too ferocious for the thin clay and the clay kept sinking into the netherworld. The creator summons a spider (called Makda Dev) and seeks help. The Spider spins and weaves a web across the large body of water. The creator spreads the clay on the web weaved on the water and prepares to create the world. The creator then releases animals, birds, and other living beings onto the earth[1].

The Gond creation myth provides a symbolic framework for exploring the cultural identity within the context of this thesis. By working with narratives that are familiar to users, it enhances their overall engagement with the installation. Even though the context and the narrative are new, unless they are members of the Gond community, users can explore these layers and unwrap deeper meaning, as they are more likely to interpret familiar stories. By integrating generative AI and tangible objects as interfaces, users can actively co-create and engage in revealing the myth scene by scene. The use of technology helps in creating a digital format of the narrative, along with the tangible objects creating a multi-sensorial, participatory narrative experience for the user.

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1 Hashmi, S. (2009, June 19). Habib Tanveer and the Gond myth of Creation. KAFILA. https://kafila.online/2009/06/19/habib-tanveer-and-the-gond-myth-of-creation/

1.6 Research Scope & Limitations

This thesis project explores the themes of tangible user interfaces, storytelling, and generative AI. The concept of working with everyday objects or three-dimensional objects as storytelling elements seemed broader a context, which is beyond the scope of what can be achieved within the duration of this project. Hence due to time constraints, and other factors that were discovered during the prototyping experiments, exploration of tangible objects is focused on two-dimensional abstract forms.

The initial intent for establishing the creation myth as a basis for the narrative was to incorporate various versions of the myth from across the globe. The rationale for this was to create a space for real-time comparative approach between these versions of the narrative. Again, due to time constraints, the focus shifted to working with just the Gond tribe's creation myth as a proof of concept to convey the objective of stories as a medium to encourage community engagement and for cross-cultural learning.

As for the generative AI component, the field of AI is rapidly evolving, and new advancements will occur while developing the thesis. This project will focus on utilizing currently available technologies, acknowledging that future developments might offer even greater capabilities. It is important to be aware of and address the ethical considerations determining the ownership and fair use of the generated image. The project acknowledges the ethical concerns surrounding AI image generation, particularly regarding copyright, transparency, derivative works, and creator responsibility. The requirement of running models locally on TouchDesigner and budgetary constraints, limits the exploration of other potentially powerful models that might require cloud computing or incur licensing costs. To navigate these concerns within the scope of this project, Stable Diffusion was chosen due to its open-source nature and focussing on artistic exploration rather than commercial applications.

Chapter Two:
Critical Literature and Contextual Review

With the advancements in AI (Artificial Intelligence) and ML (Machine Learning) technologies, there is a larger technological gap in how these tools are perceived and received currently by users across various disciplines. Thus, this project aimed to create an interactive space integrating generative AI for users to co-create. In this literature and context review I explore the broader themes of Tangible User Interfaces, storytelling, and Generative AI and how they can be combined in creating engaging user experiences.

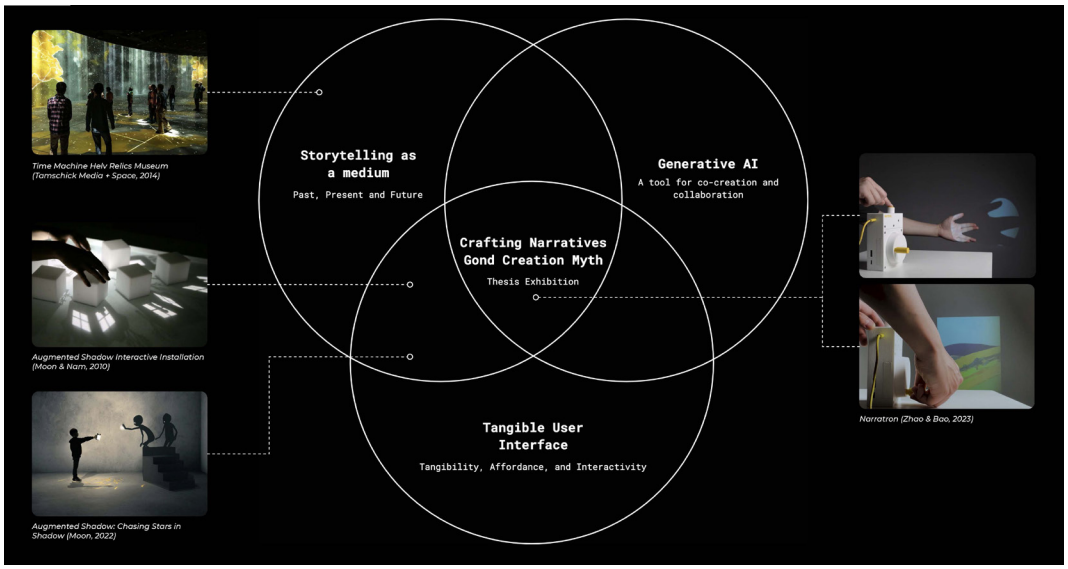

Image 2.1 : Venn diagram mapping contextualizing the related works review within the themes of the Literature Review

2.1 Tangible objects as interfaces: Tangibility, Affordance, and Interactivity

Over the past few decades, the concept of tangible user interfaces has been very prominent within the realm of Human Computer Interaction (HCI). Tangible user interfaces (TUI) enable interactions in the digital world through the physical world. TUIs (tangible user interfaces) have emerged as a new form of interface that draws

upon user's knowledge from the real-world and can enhance how users interact with and leverage digital information (Shaer, 2009). TUIs serve as tangible representations of data, where physical objects can be designed to serve dual roles as both input and output devices. These objects serve as feedback systems that facilitate communication with the user, particularly in conveying that physical manipulation of these objects could result in the initiation or completion of specific tasks in the digital environment (Ullmer & Ishii, 2000). In addition to functioning as tactile controllers, the feedback system informs the user of the computational interpretation and response based on the users' interactions with these objects.

Thus, the interaction with TUIs is not only restricted to visual and auditory senses but is highly driven by the sense of touch. These tangible objects are not limited to two-dimensional forms or shapes, they can be three-dimensional resulting in a three-dimensional interaction both in the physical and digital environment. "We live in a complex world, filled with myriad objects, tools, toys, and people. Our lives are spent in diverse interaction with this environment. Yet, for the most part, our computing takes place sitting in front of, and staring at, a single glowing screen attached to an array of buttons and a mouse." (Wellner et al., 1993).

As technology advances, from workstations to recreational activities, an array of devices has become an integral part of our livelihood. Screens have become an integral element of modern living, serving as a medium for communication, information dissemination, and entertainment. This screen-centric nature has led to a normalization of interactions mediated through visual interfaces. A diverse range of controllers have emerged in the past, and a notable shift can be seen in the several types of actions as input. Human-computer Interactions (HCI) researchers have developed a vast range of interaction styles and interfaces (Shaer, 2009) for an accessible and inclusive user experience. Tangible user interfaces enable expanding the digital world beyond screens into a blended physical-digital environment.

The concept of “affordance” has been very prominent in the fields of HCI, and a large amount of research has been done to explore frameworks and understand affordances. The term was first introduced by Gibson, where it was conceptualized as the interactions between species(animals) and their environments (Gibson, 1979). A few important concepts drawn from Gibson’s theory of affordances are the direct perception of objects; which suggests that individuals directly perceive affordances in the environment without the need for cognitive processing or intermediary representations. Secondly, the role the environment plays in determining the actions that are possible by an observer, meaning the environment contains certain information not just about the objects but embedded in the relations between the observer and the environment. Lastly, the direct relation of the affordances to the actions, which denote the possibilities for meaningful interactions between the observer and their environment. These affordances are not only to define what the object is, but rather focusses on what the observer can do with or do to these objects in the environment.

The concept of affordances was then introduced to the HCI community by Don Norman. “The term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman, 2013). In addition to this, he also talks about the concept of signifiers, those are ‘cues’ that indicate what action is to be taken and how the object can be used. Signifiers often help in communicating to the observer on what is to be done and can be used in designing an intuitive user experience. A few other concepts which are truly relevant while designing interactive experiences are constraints, mapping, and feedback (Norman, 2013). Constraints work hand in hand with affordance as they help in understanding the possible actions a user can take, whilst guiding their behavior to avoid errors. By providing physical, logical, semantic, and cultural constraints one can guide the user through their actions easing interpretation. Mapping is an important concept while working with TUIs, as they define the relationship between the objects as controllers and their effects i.e.,

outcome. Lastly, communication of the results of an interaction or a particular action as close to a real-time response is important to keep the user engaged in an experience. In the absence of feedback, users may experience distractions or a potential decline in interest. As such, the provision of feedback emerges as an imperative element in mitigating these challenges and maintaining user engagement.

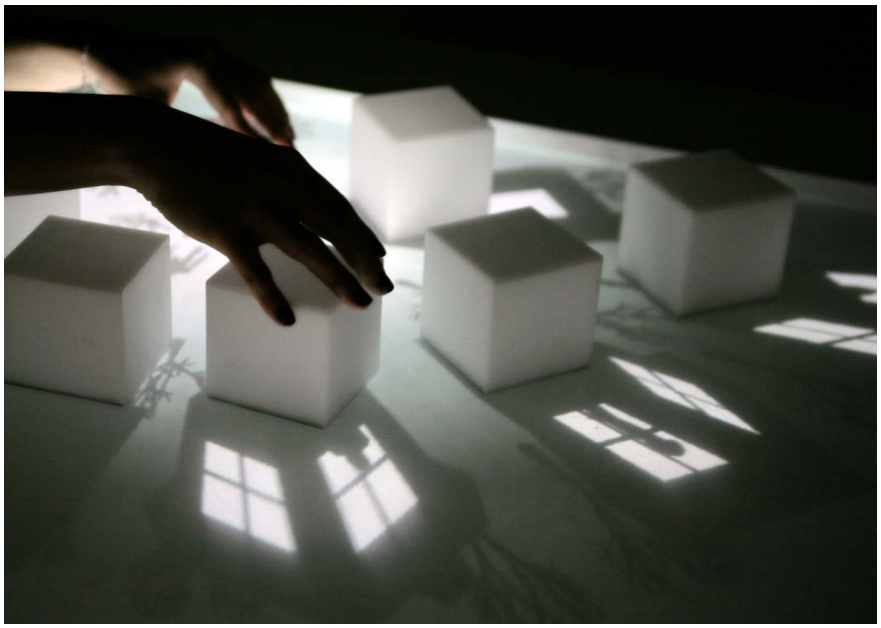

Image 2.2 : Augmented Shadow Interactive Installation (Moon & Nam, 2010)
(Photo Credits: https://joonmoon.net/Augmented-Shadow)

Augmented Shadows (Moon & Nam, 2010) is an interactive installation, and a design experiment conducted by Joon Moon and Su Hyun Nam to create an artificial shadow effect using tangible objects (blocks) on a tabletop display interface. The shadows act as an interface metaphor connecting the real-world users to the virtual world. The shadows created by the objects exist in the real and virtual environment, creating an augmented distortion effect. As users move the tangible blocks around the table, the shadows cast by these objects are brought to life in the virtual world. The interplay of light and shadow along with the tangible blocks create an augmented narrative environment blurring the boundaries between real, virtual and fantasy realms. The use of tangible blocks as an interface adds a tactile dimension to the storytelling process, allowing users to physically engage with the narrative. This

seamless blend of physical and virtual environment creates an engaging narrative experience that encourages active participation from the users.

This installation represents a fascinating exploration of interaction design through tangible objects as interfaces for non-linear storytelling. The elements in the virtual world coexist alongside the tangible blocks, interact with each other, and complete the narrative. This hands-on approach to storytelling through tangible blocks as interfaces enhances user engagement by allowing them to actively participate in shaping the narrative.

As this thesis project aims to explore the possibilities of tangible objects as collaborative interfaces, understanding how tangible user interfaces (TUIs) facilitate interactions between the physical and digital worlds is crucial. TUIs serve as tangible representations of data, enabling users to interact with digital information through physical manipulation. The tangible objects in the installation allow the users to interpret, visualize and build their own versions of the scenes, to form and shape the narrative. The scenes created on the plinth are then directly translated into an AI generated visual. From this, it becomes increasingly clear that concepts such as constraints, mapping, and feedback are required for guiding user behavior and maintaining user engagement in interactive experiences. Additionally, affordances help in designing intuitive user experiences that effectively communicate how objects can be used.

2.2 Storytelling as a medium: Past, Present and Future

The practice of storytelling has evolved over time encompassing various mediums and is prevalent across diverse cultures. Stories were shared by humans over generations, from sitting around a campfire listening to tales of ancestors to watching films and other content on television, humans are inveterate producers and consumers of stories (Smith et al., 2017). Historically, traditional methods of conveying

stories can be traced back to cultural narratives that were orally conveyed and passed on, intricately interwoven with societal values and moral lessons. The act of conveying stories served as a medium for sharing knowledge, which were performed during communal gatherings, often used as a method for preserving wisdom and ensured that the narratives were passed on from one generation to the next.

In Walter Benjamin's essay "The Storyteller," Benjamin suggests that traditional stories often contain recurring elements, these elements are referred to as archetypes. These archetypes consist of recurring themes, characters, and situations which can be easily identified in myths, legends, and folktales. These stories are often similar, can have various versions based on origin, resonate across cultures and time periods (Benjamin et al., 2019). One such archetype is the universal story and the timeless narrative of the creation myth. The creation myth serves as a medium for conveying ideas, encapsulating fundamental questions on origin, existence, and purpose. As discussed in detail earlier in this paper, the Gond tribe's creation myth story echoes their spiritual connection to the forest while offering an interesting symbolic framework for understanding their culture, values, and their place in the world. Though Benjamin's concepts from the essay "The Storyteller" does not necessarily transfer into the scope of this project, many theorists, and researchers have challenged Benjamin's views in several ways, some of which will be discussed within the concept of how interactive storytelling technologies have the potential to enhance narrative experiences which is relevant in the context of this project.

Over time, storytelling has evolved to encompass a diverse array of mediums and formats, from oral narration to performances, cave paintings to visual storytelling, and written literature to print media. Some of these narratives were further characterized by their performative nature, wherein various artistic and creative expressions, such as dance, music, drama, and poetry, served as storytelling mediums (Yilmaz et al., 2018). In the mid 1400's the invention of the moveable printing press by Johannes Gutenberg revolutionized the art and landscape of storytelling. The printing press

allowed mass production of written materials for distribution of work to a wider audience and increased literacy on a global scale (Murphy, 2018). During the 1800s, newer technologies such as film, camera and film projectors ushered in a new era of visual storytelling and allowed audiences to experience moving images. Throughout the 20th century, various visual mediums like film, television, and animation allowed writers, artists, and storytellers to expand the scope, imagine characters, scenarios, and narratives by bringing them to life. With the introduction of computers in the mid 20th century, stories were made more accessible through digital publishing (Murphy, 2018). In Walter Benjamin's essay "The Storyteller," Benjamin critiques that modern forms of technology used for communicating information focused more on entertainment which diminishes the experiential qualities of a shared narrative in the context of storytelling (Benjamin et al., 2019). He also argues that modern media, especially mediums such as film and radio, can weaken the shared narrative space that traditional storytelling endorsed due to cultural homogenization and individualization. However, he acknowledges the potential for new storytelling forms to merge but emphasizes the importance of retaining traditional storytelling with a focus on authenticity, community engagement and transmission of values.

As a counterpoint towards Benjamin's take on modern technology, Marshal McLuhan in his works "Understanding Media" introduces the concept of "media ecology" where technology is viewed as an extension of human senses, for understanding their interconnectedness and impact on social, cultural, and cognitive changes. McLuhan's work became a cornerstone of media theory, where he proposed that the "medium is the message," which means the form and structure of communication technologies have a greater impact on society than the content they carry. He argues that each communication technology shapes our understanding and perception. He introduces the term "hot" and "cool" media; hot media provides a complete sensorial experience with lesser engagement from the audience, whereas cool media requires active participation from the audience, and engagement for understanding the content (McLuhan, 2001). However, he addresses the potential of

digital media for offering interactive, participatory modes of engaging the audience which creates a scope for reviving some aspects of communal storytelling.

The present-day technological landscape presents a vast range of storytelling mediums, far surpassing traditional mediums such as literature and film. In Marie-Laure Ryan's work "Narrative as Virtual Reality," she delves into the constructive collaboration between storytelling and digital technologies. She explores the semiotic phenomenon of VR (Virtual Technology) and rethinks textuality, narrativity, and the cognitive processing of texts considering the new modes of artistic world construction that have been made possible because of the technological development (Ryan, 2001). The concept of immersive experiences has redefined how we engage with narratives blurring the lines between author and audience. Transformative immersive technologies like AR (Augmented Reality), VR (Virtual Reality) and MR (Mixed Reality) allow users to be a central part of the narrative blurring the lines between reality and fiction. Game theorists have also explored the intersection of storytelling and game theory, highlighting the narrative's role in shaping player behaviour and understanding. In Katie Salen and Eric Zimmerman's works in "Rules of Play: Game Design Fundamentals," the authors define core concepts such as "play," "design," and "interactivity." One of the key game design schemas presented in their work is "Narrative as Play;" Where they look at game a medium for storytelling and explore how game dynamics can contribute to narrative construction and player engagement (Salen & Zimmerman, 2010).

Platforms like social media, blogs, and podcasts democratize storytelling, empowering individuals to share their voices with global audiences. Marshall McLuhan's concept of "Media as Extensions of Man" (McLuhan, 2001) resonates here, as technology shapes how stories are conceived, consumed, and shared in our interconnected world. This eventual progression of storytelling mediums has led to the concept of "transmedia storytelling" (Jenkins, 2006) introduced by Henry Jenkins. "Transmedia storytelling represents a process where integral elements

of a fiction get dispersed systematically across multiple delivery channels for the purpose of creating a unified and coordinated entertainment experience. Ideally each medium makes its own unique contribution to the unfolding of the story" (Jenkins, 2006). Transmedia storytelling also provides a framework to move beyond author and audience, to storyteller and listener, creator and co-creator, agent and advocate, narrative custodian, and ally. In Marie-Laure Ryan's work "Transmedia Storytelling: Industry Buzzword or New Narrative Experience?," the author analyzes Henry Jenkin's definition of transmedia storytelling and the key concepts, examining whether if it is indeed a form of storytelling or a marketing strategy (Ryan, 2015). The concept of transmedia storytelling is commonly associated with the entertainment industry, with its theory typically discussed in the realms of media or fan studies (Hancox, 2021).

The capabilities of transmedia storytelling have been demonstrated by a new generation of documentary films and filmmakers. This new form of storytelling was then identified as interactive documentaries (Whitelaw, 2002) or iDocs (Aston & Gaudenzi, 2012). The term 'interactive documentary' was coined by Mitchell Whitelaw in the year 2002, essentially to describe those documentaries that challenged the principle of narrative coherence. "A space where maker and user select individual elements thereby changing and producing multiple relations between these elements" (Brasier, 2018). Interactive documentaries enable non-linear storytelling experiences, allowing the user to navigate through the narrative based on their preferences.

The evolution of storytelling mediums from traditional formats to modern digital non-linear formats, has been influenced by technological advancements and the approach towards participatory modes of engaging with narratives. The future of storytelling promises exciting possibilities across diverse formats and mediums. Advancements in artificial intelligence (AI), machine learning, and interactive storytelling technologies hold immense potential to redefine how we experience and share stories. Generative AI specifically shows potential as it can generate multi-modal

content such as text, audio, images, videos, and even three-dimensional models, is already demonstrating its capabilities through models like ChatGPT[1], Midjourney[2], and Deep Brain[3] (Zhang et al., 2023). With AI-driven storytelling, experiences can be customized as per individual's preferences, creating unique experiences for each user. Through interactive narratives, where the user's choices directly impact the story, will challenge the traditional author/narrator-audience roles. Moreover, immersive technologies like mixed reality (MR), extended reality (XR), virtual reality (VR) and augmented reality (AR) are continuously evolving, offering complex models for crafting immersive stories that allow the users to be a part of and actively participate in the narrative. In conclusion, the evolution of storytelling reflects the dynamic interplay between technology, culture, and human creativity. From ancient oral traditions to contemporary digital narratives, the fundamentals of storytelling have remained consistently adapting to modern technology for a better reach, access, and impact.

By examining the key learnings from this review on how stories serve as a medium for sharing knowledge, preserving wisdom, and conveying cultural values across generations through technology as a medium helps in understanding the ever-evolving canvas of storytelling. And so, these perspectives are fundamental in the shaping of this thesis project for exploring new modes of interactions for users to engage in real-time generative narratives. The interactive aspect of the thesis installation provides viewers with an opportunity to actively participate in the creation myth narrative through a "comparative approach" (Campbell, 1959) for cross-cultural analysis, enabling a deeper understanding of myths from diverse cultures. This engagement occurs through tangible objects as interfaces, alongside the utilization of generative AI, resulting in a non-linear unfolding of the narrative.

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1 ChatGPT (Chat Generative Pre-trained Transformer) is a chatbot developed by OpenAI - https://openai.com/blog/chatgpt

2 Midjourney generates images from natural language descriptions, called prompts, similar to OpenAI's DALL-E and Stability AI's Stable Diffusion. - https://www.midjourney.com/home

3 Deep Brain - https://www.deepbrain.io/

Image 2.3 : Augmented Shadow: Chasing Stars in Shadow (Moon, 2022)
(Photo Credits: https://joonmoon.net/Chasing-Stars-in-Shadow)

Chasing Stars in Shadow (Moon, 2022) is an immersive installation where the viewer is an active part of the story. The Augmented Shadow technique creates an optical illusion where the flat shadows appear three dimensional to the viewer as the story progresses. Additionally, the use of Augmented Shadow technique adds a unique dimension to the storytelling, blurring the lines between reality and illusion. The integration of tangible objects as interfaces enhances user interaction and participation, allowing viewers to be immersed in the narrative. The viewer's light (torch) is a key element, as the light from the torch moves the shades and shadows in both the physical and digital space (created by projection mapping). As the viewer interacts with the story, the characters in the story 'shadow kids' change forms between two dimensions (2D) and three dimensions (3D). Viewers actively shape the story's progression in a non-linear manner, creating a connection with the characters and their journey. The characters 'shadow kids' also interact with the viewer by directing them to a specific part of the installation, which enhances the viewer's movement within the narrative and in the immersive environment. The story is also crafted so that the various elements and interfaces such as the viewer's light, the shadows, the optical illusion, and the immersive environment are seamlessly incorporated

into the narrative. The rationale towards this is aimed at fully engaging the viewer in the narrative experience. The unique storytelling technique of trying to break the boundaries of the projection surfaces shifting from flat to three-dimensional visuals through the play of light and augmented shadow technique is very interesting. The seamless incorporation of technology into the narrative creates a truly immersive experience, where viewers are not mere spectators but active participants in the storytelling process. The tangible interface (torch) helps the viewer navigate through the narrative environment; this is a key learning for understanding the concepts of both TUI's, non-linear methods of storytelling and a blend of physical-digital elements for creating an engaging narrative experience.

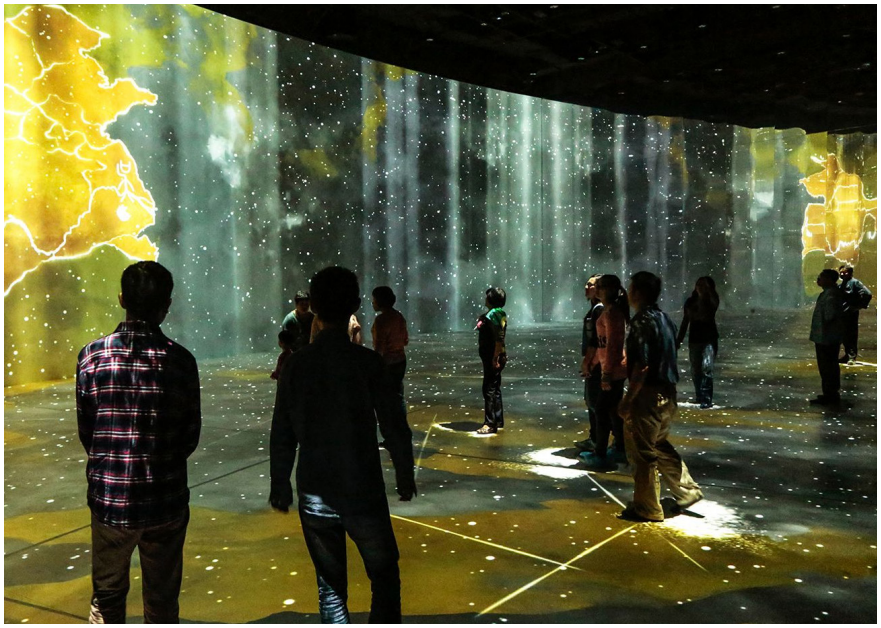

Image 2.4 : Time Machine Helv Relics Museum (Tamschick Media + Space, 2014)
(Photo Credits: https://www.tamschick.com/project/time-machine-helv-relics-museum)

Similarly, in Time Machine at Helv Relics Museum (Tamschick Media + Space, 2014), the large format interactive media installation is an interesting blend of traditional storytelling and interactive technologies. The incorporation of motion tracking cameras and large-scale projections creates a real-time interactive narrative environment for the viewers, transforming the user experience from passive observation into active participation. The distinct visual style is a blend of live action

cinematic martial arts film overlaid with paint-style animations. This fusion of styles and elements adds depth to the linear storytelling technique, creating an immersive experience for the viewers. As the viewers journey through the narrative, they are transported back in time, away to King Helv's coming into power, his fight for hegemony, the victory at the battle of Boju and other great legends of that period. The portrayal of the historical narrative surrounding the renowned Kingdom of Wu, spanning between 514-496 BC, through dynamic interactive visuals facilitates community engagement and exploration of the kingdom's legendary history. Moreover, the scale of this interactive media installation allows the capacity to host a large group of audience. The adaptation of technology creates a scope for preserving historical narratives; digitizing these narratives serves as a form of documentation and provides access to a diverse audience. In the context of this thesis project, it is important to understand three key ideas; 1)Understanding the potential of newer mediums for storytelling; 2) Understanding ways of non-linear storytelling through active participation from the audience; 3) Understanding the ways in which cross-cultural storytelling can encourage community engagement.

2.3 Generative AI: A tool for co-creation and collaboration

Artificial Intelligence (AI) and Machine Learning (ML) technologies are rapidly growing and have introduced powerful tools such as Generative AI (Bandi et al., 2023). Generative AI consists of models such as ChatGPT[1], Dall E[2], Stable Diffusion[3] that can be used for generating new content, including text, audio, visuals such as images, simulations, and videos. With the introduction of generative AI, exploration of applying these models in creative fields has seen some development. In Pasquinelli and Joler's "The Nooscope manifested: AI as instrument of knowledge extractivism,"the authors present an interesting overview of the emerging field of digital art and argue against

1 https://openai.com/blog/chatgpt

2 https://openai.com/dall-e-2

3 https://stability.ai/stable-image

the idea of AI as completely autonomous and creative. They emphasize that the role of a human is high in directing AI art creation, and that AI-generated art always involves a human who selects the dataset, configures the model, and ultimately interprets the output. “Recently, the generative modality of machine learning has had a cultural impact: its use in the production of visual artefacts has been received by mass media as the idea that artificial intelligence is ‘creative’ and can autonomously make art” (Pasquinelli & Joler, 2020). Despite the misconceptions surrounding generative AI models, the authors acknowledge that generative AI models are valuable, as they serve as a “reality check” in understanding how these models perceive and represent the world.

Pasquinelli and Joler’s take on AI art creation is very interesting as they argue that the AI art creation process is human-driven, where these models act as tools and that humans co-create alongside with these tools. Acknowledging the fear regarding AI potentially take over our jobs and looking at AI as a support system, it is crucial to analyze and understand the potential of how these models can act as co-creation tools. It is important to create a space where there is active collaboration between Human and AI, for a better understanding the capabilities of these Generative AI models. AI models could also help in creative problem solving and collaborative decision-making capabilities.

“Human-centered AI (HCAI) emphasizes the design of AI with the awareness that it is part of a larger system consisting of human stakeholders” (Riedl, 2019). Recent AI development started to emphasize empathy and alignment with human requirements, AI transparency and explainability (i.e., to address AI’s interpretability and comprehensibility), AI ethics and governance, as well as digital transformation through AI literacy and intelligence augmentation, address the need for an interdisciplinary approach for the human aspects of collaboration with AI (Mitchell et al., 2020, p.124). The HCAI framework is an approach towards understanding three main concepts: Firstly, the design for elevated levels of human control over the model

for increasing human performance, secondly identifying situations in which the level control can be mediated between human and computer and lastly, avoiding excessive control on one of the collaborators (Shneiderman, 2020). The rise of HCAI signifies a critical shift in understanding the human relationship with artificial intelligence. By acknowledging AI as a part of a larger human-computer ecosystem, the development of HACI through an interdisciplinary approach can increase the potential collaboration and the application of AI tools specific to user requirements.

Drawing parallels to cognitive sciences, in “Things That Make Us Smart: Defending Human Attributes in the Age of the Machine,” Don Norman proposes two key modes of cognition that influence how we interact with technology: Experiential cognition and Reflective cognition. The experiential mode is intuitive, immediate where humans perceive and react to the environment efficiently and effortlessly. On the other hand, the reflective mode is analytical and thought-provoking which involves decision making, and critical thinking. These two modes are a broad categorization of human cognition, and they are not completely independent. Most often than not, “technology seems to force us towards one extreme or the other” (Norman, 1993) but it is possible to have a combination of both as they complement each other; where humans can enjoy the experience while simultaneously reflecting upon it. In the context of this thesis project, the viewers are invited to interact with the physical artefacts placed on the plinth and experience the story as it unfolds, which rely on experiential cognition. But the viewers are also actively participating, co-creating, and engaging with AI, enhancing critical reflection in understanding the potential of the generative AI model. “Without a good understanding of these modes coupled with an understanding of human perception and cognition, it is not possible to harness technology, to make its products appropriate for people” (Norman, 1993).

The final installation developed for this project reflects this thought where human-technology collaboration is expressed through these complementary modes, where viewers are co-creating, and actively participating while being immersed in

the experience. This installation's interactive nature serves as a space for viewers to engage with the generative AI in the context of the creation myth narrative which provides opportunities for a reflective understanding of generative AI models. Through experimentation and exploration, users can critically evaluate outputs, draw parallels to other creation myth narratives and understand the capabilities and limitations of generative AI technologies.

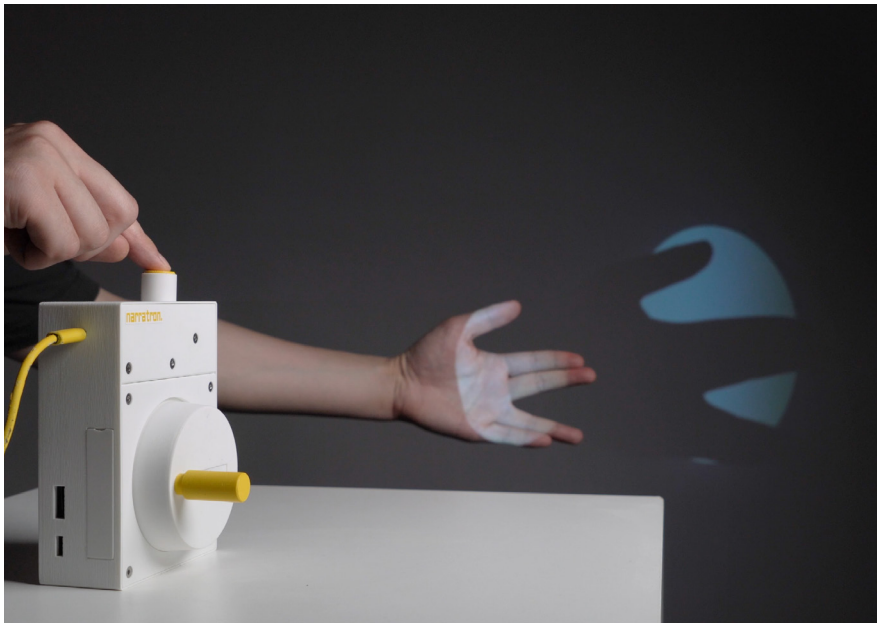

Image 2.5 : Narratron (Zhao & Bao, 2023)
(Photo Credits: https://www.xiyingbao.org/project/narratron)

Narratron (Zhao & Bao, 2023) developed by Aria Xiying Bao and Yubo Zhao at MIT's School of Architecture and Planning, is an interactive projector that merges traditional hand shadow puppetry with AI-generated storytelling to create a participatory narrative experience. It transforms traditional physical shadow plays into an immersive and physical-digital storytelling experience. The user experience is enhanced by incorporating artificial intelligence, allowing users to interact with hand shadows with AI-generated audio-visual outputs of the story their hand shadows are narrating. The user interacts with the system by creating hand shadows in front of an on-device camera, which are then passed through the embedded algorithms

that utilize multiple AI models to recognize the captured shadow image into a set of main characters of the story. This tangible form of co-creation enables the users to develop and modify the narrative in real-time by simply posing a different shadow as a new character. The design of Narratron is inspired by the physical affordances of traditional interfaces in movie projectors and cameras, taking a minimalist design approach with an intent to create a seamless user experience.

Image 2.6 : Narratron (Zhao & Bao, 2023)
(Photo Credits: https://www.xiyingbao.org/project/narratron)

Narratron is designed to offer users a collaborative and immersive experience that merges the art of hand shadow puppetry with modern AI technology. The digital user interface is also set up to introduce the users to the experience along with a set of instructions allowing users to freely explore and play with their hand shadows. Since trained image classifiers are integrated into Narratron, it allows the camera to capture intricate hand shadow shapes and these shadows can be of different shapes, sizes, and movements. The captured shadow images are then run through the model to translate the captured images into animal keywords. These keywords are important as they serve as a base for generating a complete story.

The process of generating the story is achieved through the GPT-3.5 language model. The language model seamlessly combines plotlines, dialogues, and characters

to generate a story. While the text and the audio narration for the story is being generated, a corresponding visual is also generated using Stable Diffusion. These are then juxtaposed to create an audio-visual experience for the user enhancing the user's connection to the narrative. The user initiates and progresses through the narrative by spinning the knob (action like that of a vintage movie projector) which adds a sense of nostalgia and a tangible engagement to the user experience. The users navigate through the story by rotating the knob. Each rotation of the knob is directly mapped to a new chapter, revealing new components of the narrative. This mode of interaction along with active user participation creates a sense of agency, allowing the users to direct, control and change the story as it progresses.

The combination of traditional hand shadow puppetry with generative AI technology creates a modern interpretation of ancient storytelling practices. From abstract shadow forms to a detailed audio-visual narrative using generative AI, the story allows the users to actively participate and engage with a modern yet traditional storytelling technique. Additionally, the affordances of the tangible interface play a crucial role in intuitively engaging the users with the narrative. Taking these concepts forward, combining tangible interfaces with real-time generative AI opens new possibilities for dynamic and collaborative narrative creation, where users and AI contribute to the unfolding story in real-time.

Chapter Three:
Research Methods & Methodology

The research methodology implemented in this project is Creation as Research, which is a sub-category in Research Creation (Chapman & Sawchuk, 2012). This methodology encompasses a diverse range of methods and techniques, drawn from traditional research and design disciplines. Theory, creativity, and knowledge are redefined through hands-on theoretical engagement. Creation becomes central to the research process, with the artwork itself considered a research output. This methodology emphasizes exploration and experimentation where the process is often open-ended and iterative, it allows room for articulation of new ideas and interesting, unexpected discoveries during the creation process. “In research-creation approaches, the theoretical, technical, and creative aspects of a research project are pursued in tandem, and quite often, scholarly form and decorum are broached and breeched in the name of experimentation” (Chapman & Sawchuk, 2012). Projects within research-creation can be further categorized into four distinct modes: research-for-creation, research-from-creation, creative presentations of research, and creation-as-research. Although these categories are not mutually exclusive, they are broader categorizations of multifaceted approaches to research-creation.

3.1 The Process of Research

The research process followed a combination of these modes, initiating with research-for-creation, transitioning into creation-as-research, which served as the primary methodology, and finally taking the learnings from the creation back to the research through research-from-creation. As indicated in the previous chapter, I conducted an in-depth critical analysis through literature and contextual reviews which served as a base for development of the creation. Undergoing the critical literature and contextual review method under research-for-creation methodology

helped in gathering of knowledge, ideas, and references leading to the choices of concepts pursued in the creation phase. This research is organized around three key themes: Tangible objects as interfaces, Storytelling as a Medium and Generative AI (Artificial Intelligence) as a tool for co-creation and collaboration. Through contextual reviews, relevant works and projects were studied to understand the vast body of work developed by artists, researchers, and designers within the key themes of this research.

Conducting creation-as-research in parallel to the research-for-creation mode through the iterative prototyping method enabled me to explore, test the prototypes, and experiment through the creative process. Since the core of my methodology lies in creation-as-research, the prototypes developed through the iterative process focused on exploring different mediums, materials and tools that demonstrate the potential of using tangible AI in a real-time generative storytelling experience. The three prototypes built and tested during the research are Tangible Objects in collaboration with Generative AI for scene building, Morphing Generations: Dynamic animation exploration, and Exploring Sound feedback: Integrating Sound into Interactive Environments.

Simultaneously, I conducted an evaluation of the prototypes grounded in research-from-creation mode, drawing the learning from the iterative process back to the research. This process also helped in defining the scope and limitations of this research project. The observational research method was also conducted during the testing of these prototype installations, which helped identify areas for improvement. The learnings gathered from the evaluation informed the creative decisions made during the iterative process of developing the prototypes and shaped the overall direction of the research.

3.2 Creation-as-Research: Iterative Prototyping

Through the development and testing of three distinct prototypes this section highlights the outcomes of the iterative prototyping process. Each prototype represents a unique exploration of concepts such as Generative AI, tangible objects as interfaces, and integration of sound for creating an engaging narrative experience.

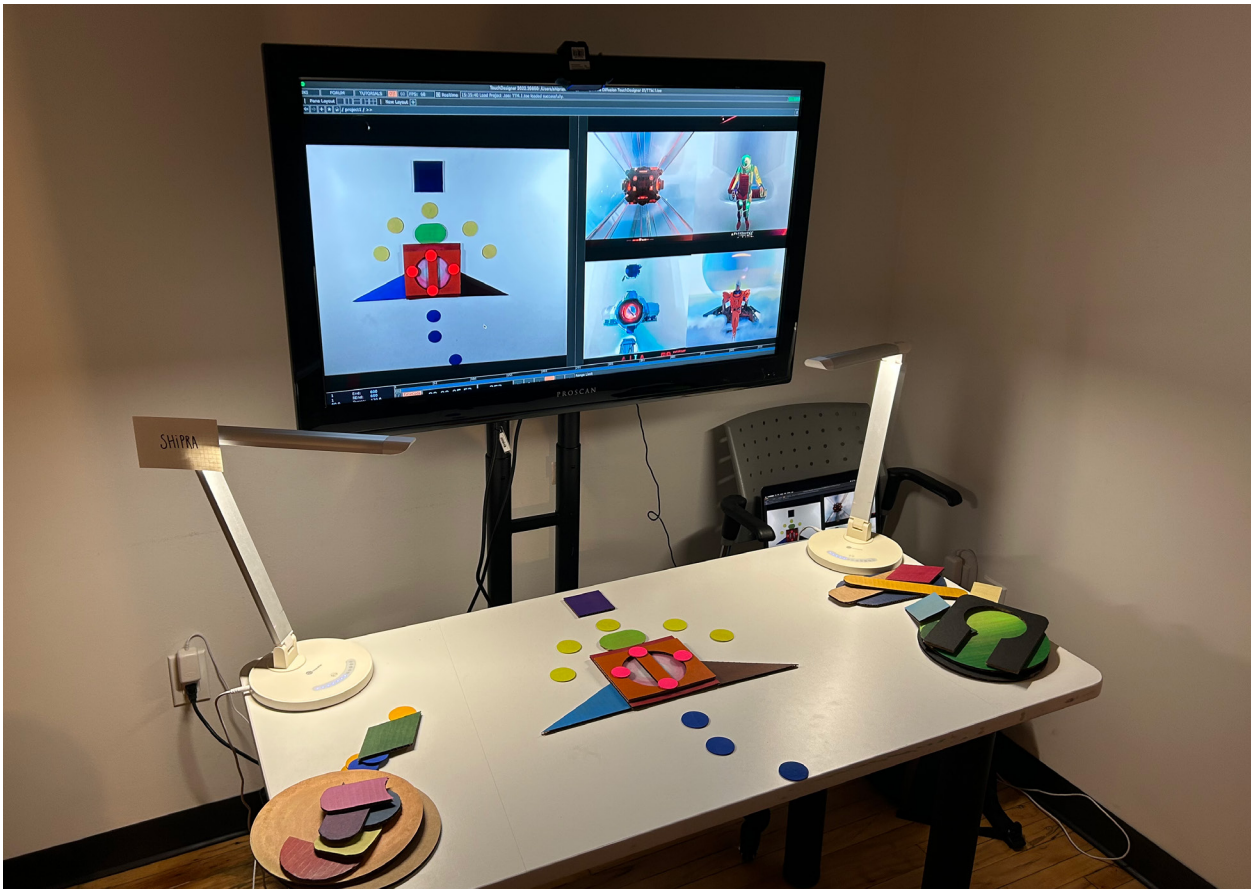

Image 3.1 : Prototype one: Tangible objects in collaboration with Generative AI for scene building

Prototype One: Exploration of tangible artefacts that could potentially act as story building elements. A pipeline for running Stable Diffusion locally on TouchDesigner is established. The prototype materializes as an interactive installation where users create the scenes on a tabletop surface using the tangible objects and the captured scenes are then reimagined using generative AI.

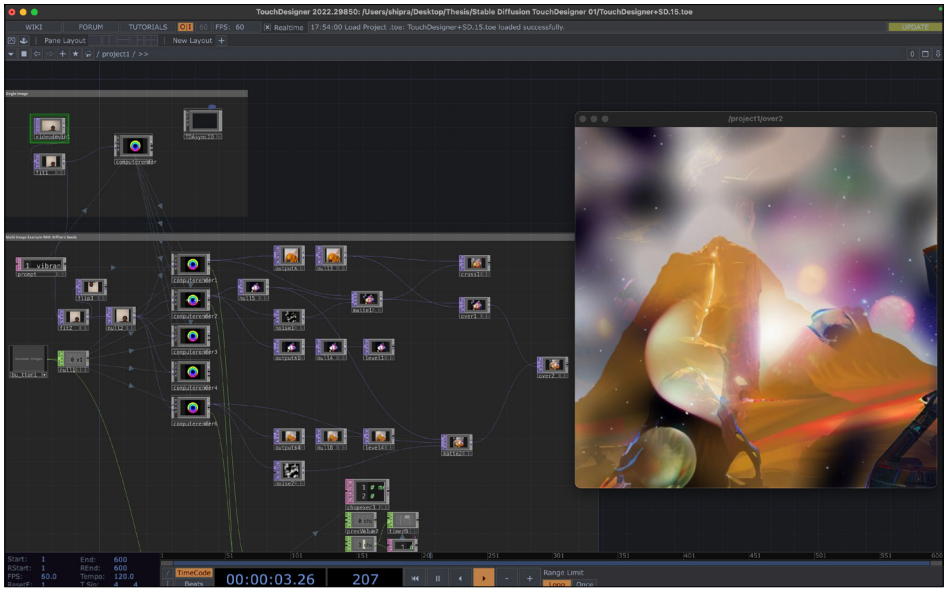

Image 3.2 : Prototype Two: Snapshot of TouchDesigner file

Prototype Two: Exploration of a dynamic animation morphing technique. By overlaying and animating different iterations of generated images, an animated visual output is achieved. While initial experimentation with particle systems proves complicated for storytelling, a simpler approach of morphing between images is adopted.

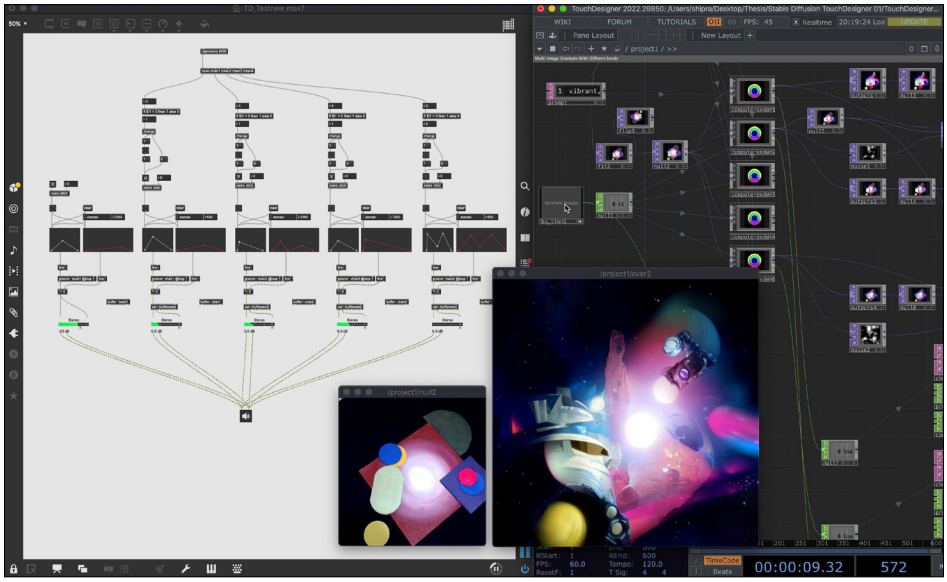

Image 3.3 : Prototype Three: Snapshot of TouchDesigner + Max/MSP OSC Communication

Prototype Three: Integration of sound feedback into the interactive environment. Initially exploring AI-generated audio, the focus shifts to Open Sound Control (OSC) for real-time responsiveness. A communication system is established between TouchDesigner and Max/MSP via OSC messaging, enabling the creation of generative soundscapes synchronized with visual outputs. This prototype lays the foundation for integrating sound as a crucial component for the narrative experience.

Image 3.4 : First Install: Visualizing the Gond Creation Myth

First Install: Visualizing the Gond Creation Myth based on the learnings and reflections from the three iterative prototypes. The segment of the storyboard extracted from the Gond creation myth serves as prompts for user-interpreted and AI-reimagined visuals. Tangible objects are redesigned to reflect elements from the myth, with colors symbolizing characters and elements. The first installation displays the interplay between user interaction, AI-generated visuals, and soundscapes, allowing users to engage with the narrative while exploring their interpretations.

Image 3.5 : First Install: Visualizing the Gond Creation Myth, Projection of Human-AI-generated visuals

3.3 Research-from-Creation: Evaluation of the Prototypes

To evaluate the three prototypes based on my subjective understanding of the literature, various criteria were analyzed in the format of a table. The evaluation was conducted considering parameters such as Tangibility, Narrative Coherence, Integration of Generative AI, and User-AI collaboration. Through this comparative analysis, valuable insights are incorporated into the scope and limitations of each prototype, which enabled further refinement of the prototypes and the development of the final thesis exhibition.

Chapter Four:
Project Development

The outcome of this thesis research is presented as an interactive installation that engages the Gond Tribe's Creation Myth as a generative storytelling experience. The installation was developed through a series of prototypes that each investigated key elements of the experience. The initial prototype investigated the use of abstract physical objects to guide an AI image generation model. The second prototype developed is a technique for morphing generated images to create dynamism and higher user engagement. The third prototype is a method for real-time sound as feedback based on the 2D objects. This was crucial for the overall user experience since the image generation process takes a few seconds. These techniques are ultimately combined with the narrative to create the final installation.

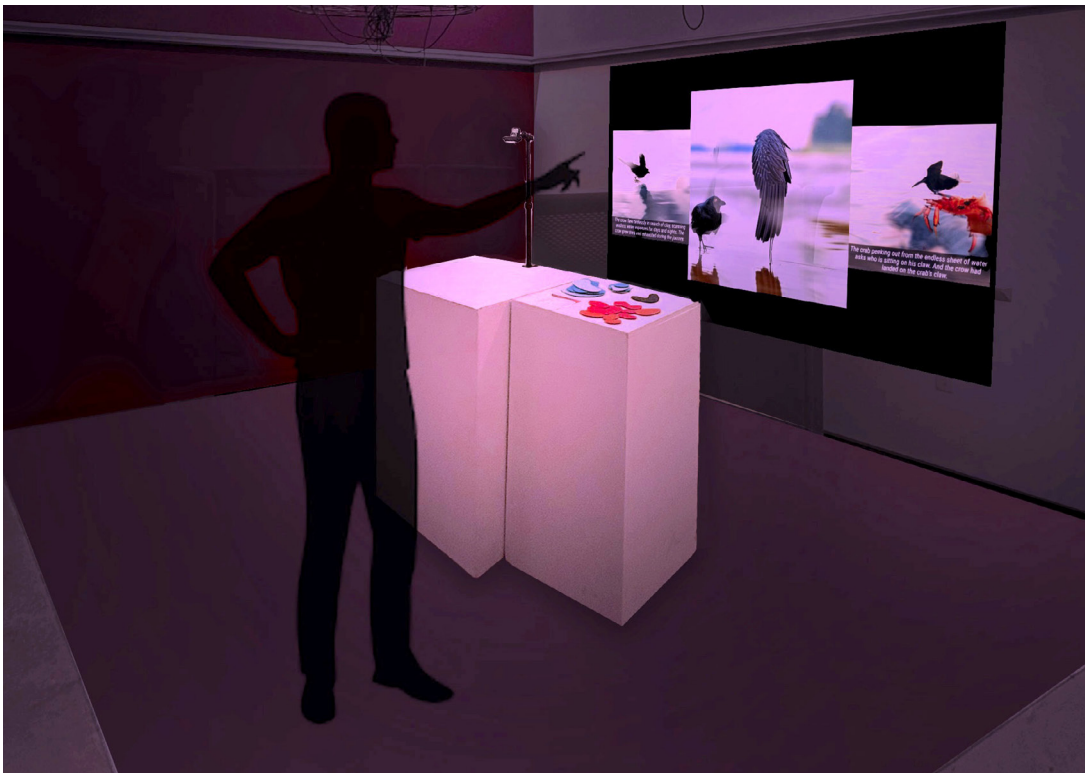

Image 4.1 : Concept sketch of the final exhibition

The final installation is an outcome of the learnings and insights gathered from the iterative prototype development process. The three prototypes and the first installation exhibition developed during the research focus on specific themes such as tangible objects as an interface for creating AI (Artificial Intelligence) generated visuals, sound design for creating engaging user experiences, and a real-time responsive narrative system. The development of each prototype is discussed in detail including the process, outcomes, observations, and reflections. Overall, this chapter aims to display the potential of Generative AI as a tool for co-creation and collaboration in a real-time narrative environment through tangible objects as interfaces.

4.0 Preface: Selection of the Generative AI Model

The first step before the development of the prototypes was to test and understand existing generative AI tools that could potentially be used for developing this project. Specifically focusing on an image generation and style transfer model that can be run locally on a laptop. This was a crucial step before diving deep, as it helps in identifying which of the text to image, text to video, image to image AI model works best in the context of creating visuals for a story. Some of the image generation models tested include Midjourney, Stable Diffusion, RunwayML and Dall-E. Based on the tests conducted, mentioned below in table (4.1) is a comparison between these models based on function, strengths, and drawbacks.

Evaluation of Selective Image Generation Models			
Model	**Function**	**Strengths**	**Drawbacks**
Midjourney	Creative exploration and Image Manipulation, Text to Image	The user interface is quite intuitive allowing limited control over the variations of output images generated. It is good for complex image editing, compiling, and refining multiple images	Requires a stable internet connection and cannot be run locally. This is also a close sourced model, making it complex for technical manipulations. A subscription is also required for long-term usage
Stable Diffusion	Image Creation and Image enhancement, Text to Image, Image to Image	The model is open source, allowing users to customize and experiment based on their requirements. The model code is available on GitHub, allowing for customization and community-driven development. The model is also good for improving image quality and adding details to images. The model can also be run locally on the laptop or pc	Requires technical knowledge for set-up and implementation of certain tasks. It is not the most user-friendly tool for beginners
Dall-E 2	Image Creation, Text to Image	The model is particularly good for understanding complex text prompts and descriptions. The model can generate high quality and hyper-realistic outputs based on the input text	The model is closed beta with limited access and subscription costs are comparatively higher. The model also requires access to OpenAI's platform and access to the internet for cloud processing resources
RunwayML	Creative editing and multi-format visual manipulation, Image to Video, Video to Video	This offers a diverse range of AI tools which includes image and video editing, style transfer, and object detection. The interface is quite user friendly for utilizing pretrained models	The model is a mixed access open-source system which depends on specific model requirements. Requires a stable internet connection for high function tasks, some features can be run locally in a system. The image generation capabilities are limited as compared to models that focus purely on image generation

Table 4.1 : Evaluation of Selective Image Generation Models

It is essential to note the rapid pace at which existing models develop, with newer versions released more frequently, and the ongoing emergence of new models during the project's development. The testing of these models offered insights on identifying a model that would be run locally on TouchDesigner. Stable Diffusion showed the potential for running the model locally and is free of cost. Since this model is known for not being the most user-friendly tool for beginners, it was an interesting challenge to employ this tool for creating an engaging and intuitive Human-AI interaction. It is particularly important to confront the issue head-on; AI image generation models display tremendous protentional but raise various ethical concerns related to copyright, transparency, derivative works, and creator responsibility. Acknowledging this concern and understanding ways to navigate this ethical landscape within the scope of this project, I decided to work with Stable Diffusion to explore the potential of Human-AI generated visuals in a narrative environment.

4.1 Prototype One: Tangible Objects in collaboration with Generative AI for scene building

The process of developing the first prototype was divided into 4 stages. First, establishing a TouchDesigner pipeline for processing AI model (Stable Diffusion) locally, achieved using Compute(r)ender. Second, Image to image style transfer testing, using a web camera along with guided text prompts. Third, material exploration and making of tangible objects which could be used for scene building. Lastly, testing of tangible objects and generative AI model for an interactive and collaborative story building process.

4.1.1 Creating the Pipeline

The prototype was initiated by creating a pipeline on TouchDesigner for running Stable Diffusion locally. The reason for choosing TouchDesigner is that the software can communicate with other software through OSC (Open Sound Control) messaging and allowed easy integration of API models as nodes within the TouchDesigner interface. Integration of Stable Diffusion on TouchDesigner was achieved through a third-party API called as Compute(r)ender (Whidden, 2023) an open-source node model created by Peter Whidden. The model is available in different formats in the GitHub[1] repository; python, PHP, and node files. Although this model is a paid model, it is more cost effective than the other services that host Stable Diffusion.

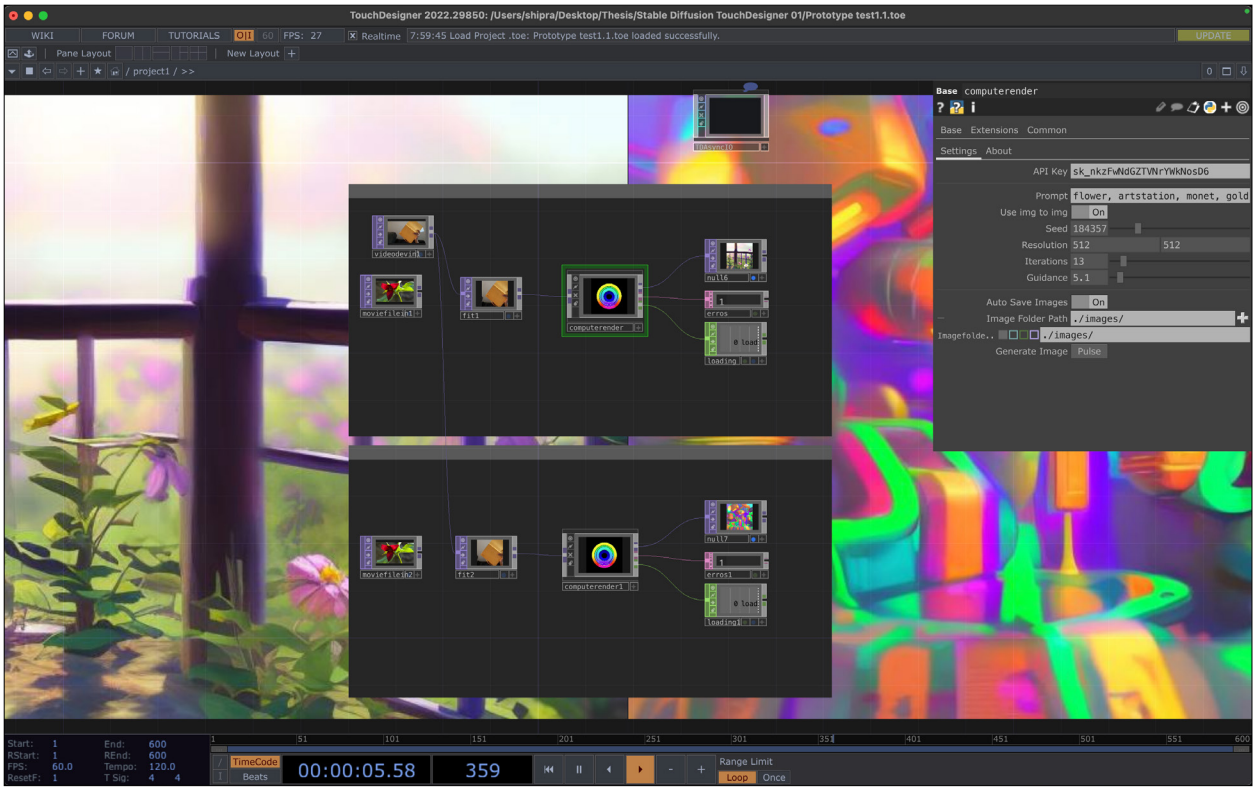

Image 4.2 : Snapshot of pipeline on TouchDesigner for running Stable Diffusion

1 Whidden, P. (2023). Computerender. GitHub. https://github.com/computerender

4.1.2 Style Transfer Technique

Typically, in an Image-to-Image generation model, the input image along with a text prompt guides the creative exploration and the manipulation of the input image to generate the output image. For example, a photograph of a scenery can be re-imagined and re-rendered in the style of a Van Gogh painting using this technique. This technique served as a base for creating a more user-driven AI generation process. Since the idea is to work with tangible objects for creating the scenes, the user has more control and agency over the scene that is created on the table. The scene created on the table using the objects is then captured using a web camera and is used as the input image for the AI model to re-imagine. The prompt selected for this installation was not derived from the creation myth story, as the primary focus was on developing the objects and establishing the pipeline.

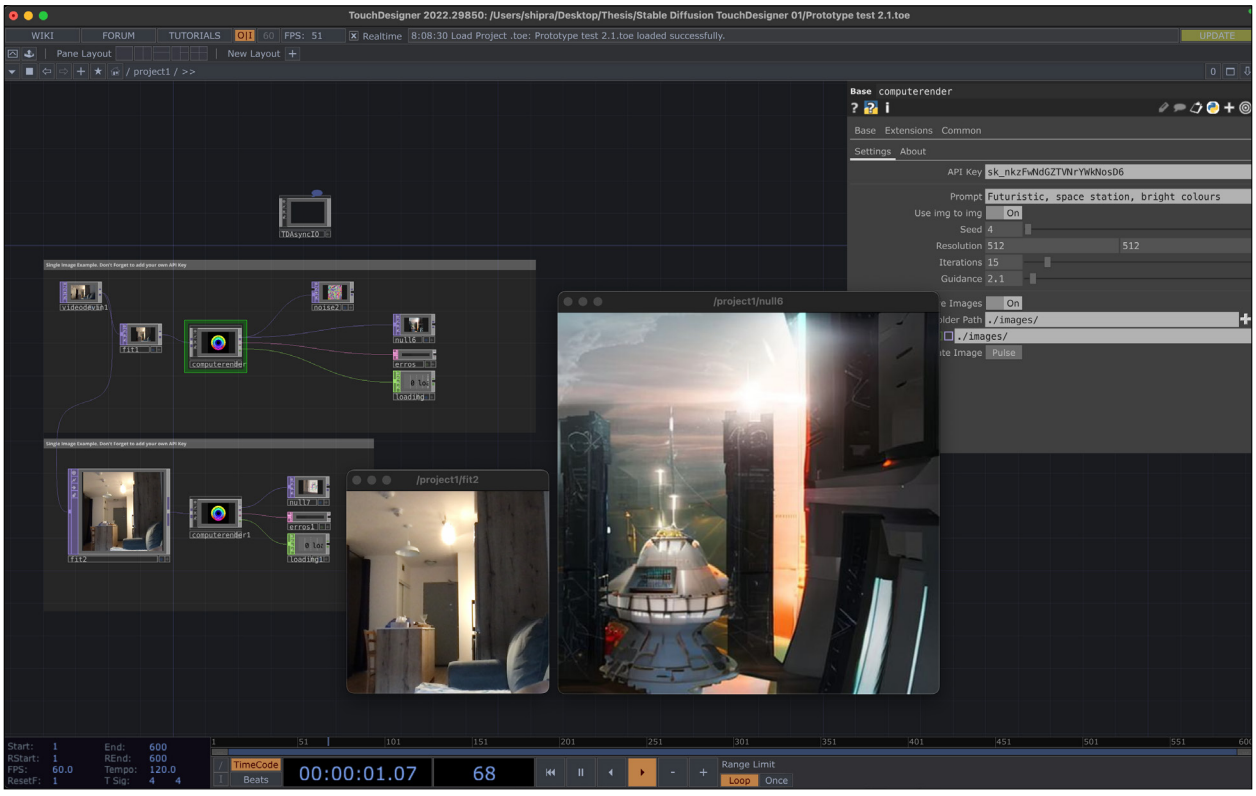

Image 4.3 : Snapshot of Image-to-Image Style Transfer Generation

4.1.3 Making of the Tangible objects

I was drawn towards the idea of abstraction to realism, where in this context the scenes created on the table are abstract and the visuals generated by AI are more realistic and rendered. This allowed more scope for imagination both for the user and the AI model. The web camera captures a two-dimensional image; the Generative AI model analyzes the form, color, composition, and the textures in the input image for the style transfer technique. Keeping in mind the learnings for understanding tangible object affordances, the objects were designed as two-dimensional abstract coloured forms. The colour palette of the generated output is also driven by the colours used in the input image, hence the shapes were made using contrasting bright colours. The composition of the objects on the table plays a significant role in directing the visuals generated by the model. The materials used for creating this prototype were cardboard and acrylic paint.

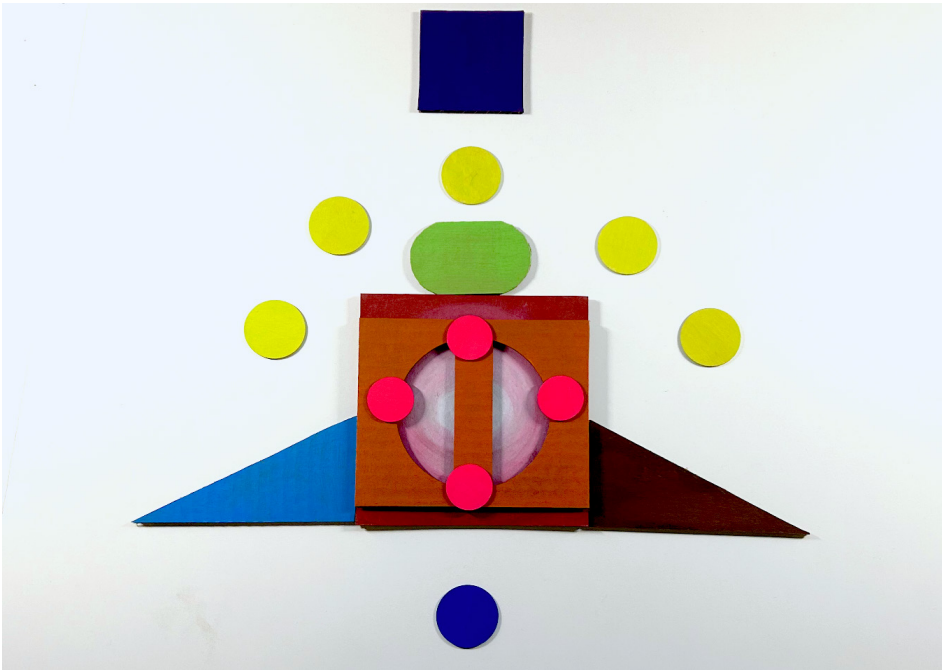

Image 4.4 : Some of the objects created for the first prototype

4.1.4 Prototype Setup

The prototype was set up as an interactive installation consisting of tangible objects, web camera to capture the scene, TV monitor (to view the generated output), Laptop (to run the code), and 2 tables. The users were free to interact with the objects to create a scene in the defined area of the table. Once the objects were placed on the table and visualized by the user, I initiated the AI generation[1] through TouchDesigner. The captured image (via a web camera) is passed through the AI model and four different variations of the generated visuals are presented on the TV monitor. The web camera feed is also presented alongside the generated visuals for users to compare what they have created verses how the AI model re-imagined their creation.

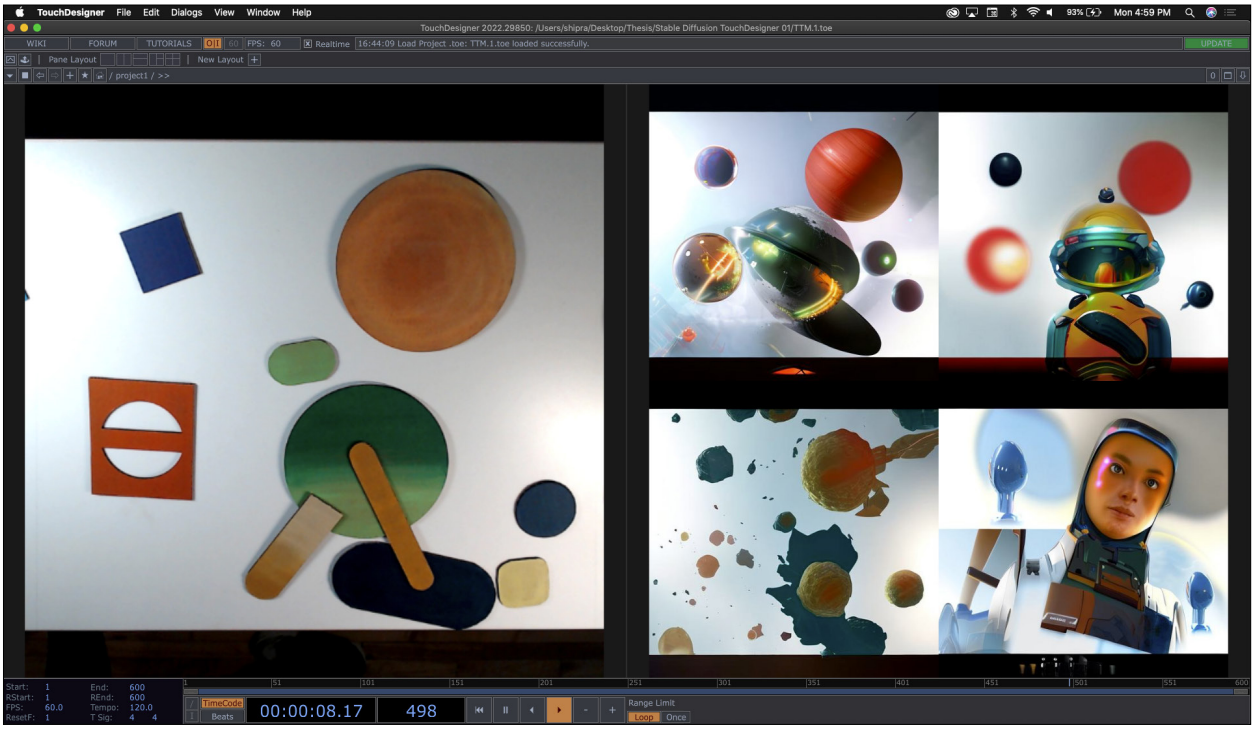

Image 4.5 : Snapshot of a scene re-imagined using Generative AI

1 Prompt: outer space, vibrant, artstation, futuristic

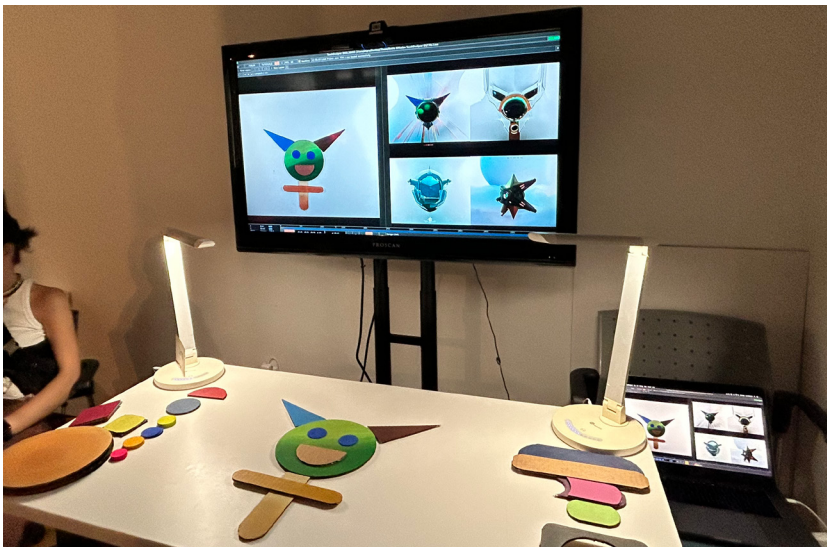

Image 4.6 : First Prototype setup

4.1.5 Observations & Key Learnings

The aim was to develop a technique that could be used to visualize frames from a story that could eventually be combined to create a narrative. To achieve this, constraints were set, and prompts were predefined, to allow the user to focus more on visualizing the scene using the objects. The main takeaway was the process of converting these abstract forms into detailed images, wherein users experienced a sense of agency over the model as they were the ones creating scenes on the table and feeling of ownership over the generated output. Secondly, the captured image is better developed if the input prompt is clear, accurate and has a good range. The objects and the prompt complement each other; that is, based on the story, the objects will have to be slightly abstract to leave room for imagination and to generate a more accurate visual. Lastly, the parameters within the AI model can be modified to generate an infinite number of outputs, allowing each image generation to be unique. This prototype aided in the concept of understanding the ways in which tangible objects could potentially act as story building elements, where placing the objects on the table automatically act as signifiers, encouraging the audience to move the objects. This allowed the user a hands-on collaborative experience to work with the model to generate storyboard scenes.

4.2 Prototype Two: Morphing Generations: Dynamic animation exploration

This prototype is a dynamic animation exploration for adding motion and movement to the generated images. The reason was to look at the potential of treating the generated visuals for organic and seamless scene transitions. The Stable Diffusion model used in this project is only capable of creating still images. In the context of creating a narrative environment, it is more interesting when movement and animation are used to create a dynamic visual experience.

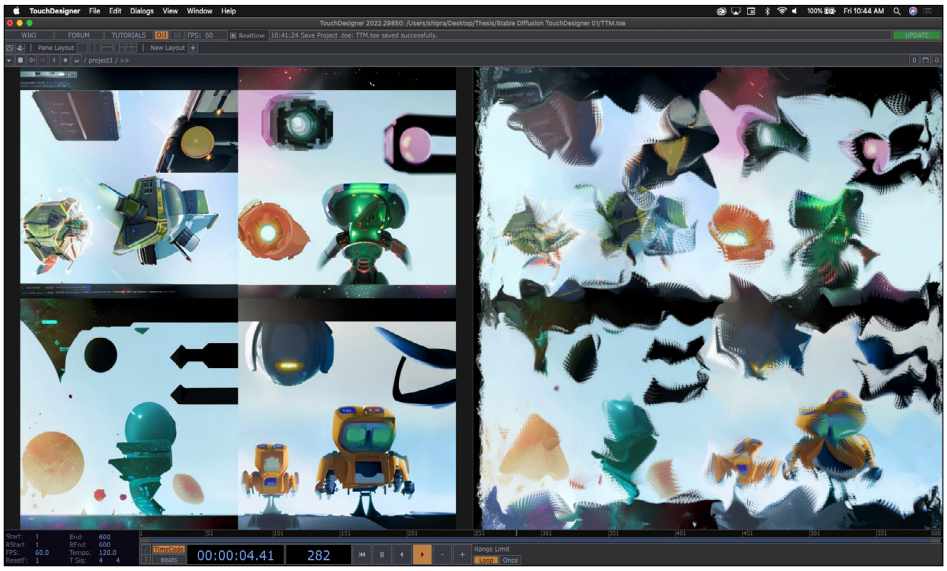

Image 4.7 : Snapshot of particle system animation exploration

Initial tests were conducted with this mindset, where the generated outcomes are passed through a particle system to break the image down into smaller particles. Adding the laws of motion to these particles created a dynamic and interesting visual output, where at static state the particle would form a complete picture of the generated image and while in motion creates an abstract data sculpture. This style of treatment, although exciting and interesting, did not seem to fit very well in the context of storytelling. The movement of these particles created an abstract imagery making it challenging for the users to perceive the scene.

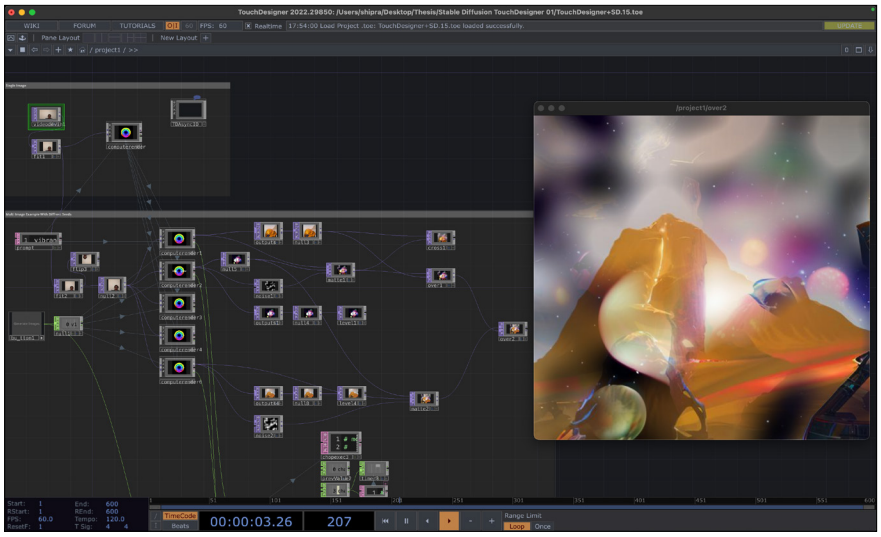

Image 4.8 : Snapshot of dynamic morphing between 3 AI-generated images

Another key takeaway from the first prototype was how different each image generation can be, creating a wider range of outcomes. This in comparison to what the user is creating on the table, leaves room for interesting conversations over the Human vs AI model interpretation. Taking this learning forward; the focus was to look at how the diverse range of iterations can be overlayed and animated to create an interesting morph of the imagined outcomes. Using the transform, noise, and overlay nodes on TouchDesigner, created a simple layering technique. Modifying the parameters of the noise node helped in creating a dynamic motion and subtle reveals in the frame. It was the key element driving the animation which resulted in an exciting morph between three generations based on the same input.

4.2.1 Observations & Key Learnings

The interesting outcome of the morphing feature was that it brought the characters and elements in the frame to life. This technique could eventually be applied to a larger scene as an output where segments of the story are revealed upon interaction with the objects. While overlaying the images, certain features in the visuals get hidden. These hidden features are revealed in an interesting manner during the morphing process. This, along with the tangible objects, helped in

engaging the user with the visuals; maintaining the balance between realism and abstraction, allowing more room for users to interpret the story. The outcomes of this prototype with further modifications were a key element for creating the visual language for the final exhibition.

4.3 Prototype Three: Exploring Sound feedback + Integrating Sound into Interactive Environments

This prototype looked at the component of sound and the significance of soundscapes within a real-time generative storytelling environment. In addition to the tangible objects and the animated AI generated visuals, sound plays a significant role in tying and connecting the components of this installation into a cohesive story experience. The objective with this prototype was two-fold; First was exploring generative sound creation using Max/MSP and establishing a real-time communication system TouchDesigner and Max/MSP via OSC (Open Sound Control) messaging. The second step focused on the integration of sound with the AI-generated visuals.

4.3.1 Max/MSP and TouchDesigner Communication

AI generated audio through models like Magenta (AI sound generation tool), for Image to Sound generation takes about 30-50 seconds per image. A decision was taken to step away from AI generated sounds to Open Sound Control (OSC), system feedback time is majorly reduced and closer to a real-time response. For this to be responsive in real-time responsive, an OSC messaging system was established on TouchDesigner for communicating with Max/MSP. Four OSC messages are sent to Max at any given stage. The first message corresponds to the initiation of the image generation, i.e., when the generate button is pressed, a message is sent to Max. The next three messages correspond to the three generated images, for conveying the completion of the image generation task. Using sound manipulation techniques such as filtering, manipulating the pitch, amplitude modulation, reverb, and delay,

prerecorded sounds from the Max library can further be treated to create generative sounds. These can then be superimposed to create a generative soundscape to suit the theme of the story.

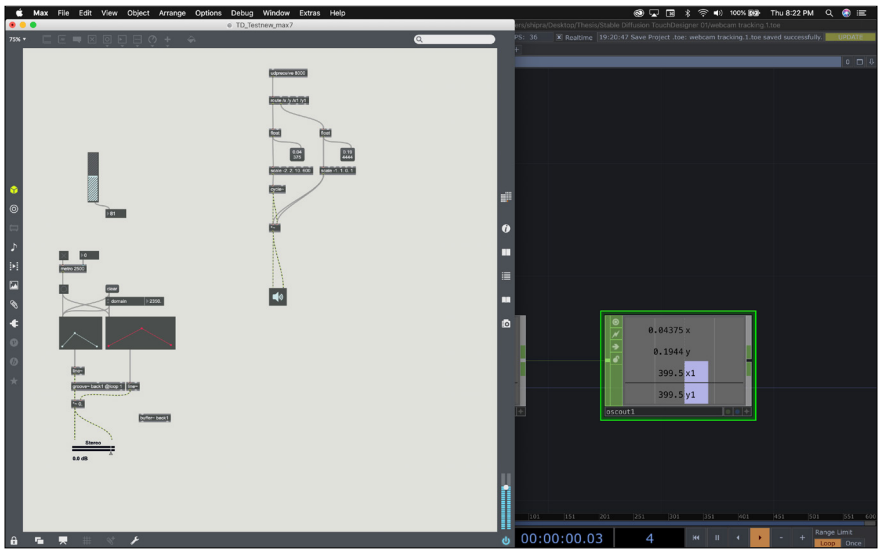

Image 4.9 : Snapshot of Max/MSP and TouchDesigner OSC Communication

4.3.2 Integrating Sound with AI-generated visuals

Once this connection was established a Lo-Fi prototype was built to experiment with sounds and understand the correlation of these sounds to the visuals. This test led to the identification of three components for the generative soundscape; a background soundscape (which plays throughout the experience), a timer layer (plays when the generate button is pressed), and three generative sounds that would play once their corresponding images are generated. A prerecorded background track is played on a loop to create the narrative environment and to inform the user of the presence of audio in the experience. The processing time for each image generation is dependent on several factors, the approximate time taken for Stable Diffusion to generate the image 2-10 seconds. A coded timer function is established on TouchDesigner to send a real-time message to Max when the image generation was initiated and a follow-up message when the task is complete. Once the image

generation is complete, the timer layer is paused, and the three generative sounds are superimposed over the background sound to create the generative soundscape for this interactive audio-visual experience.

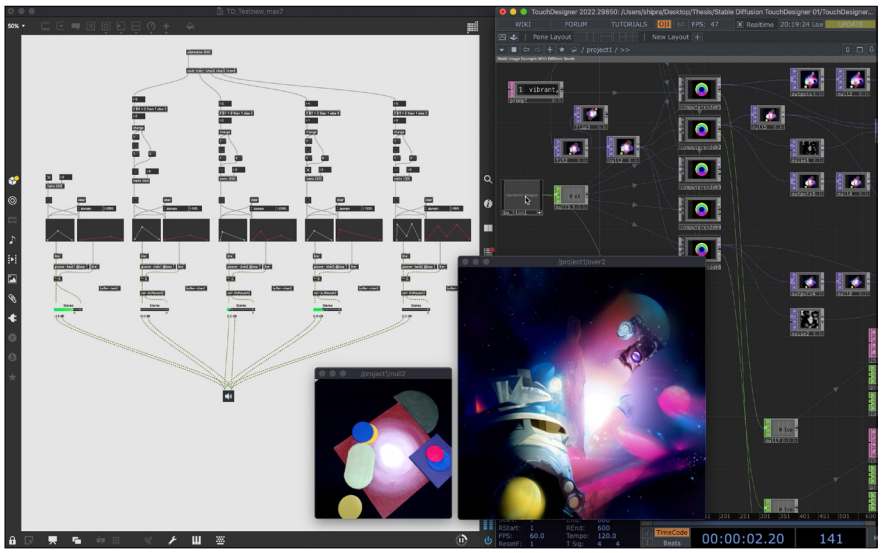

Image 4.10 : Snapshot of Max/MSP and TouchDesigner Real-time communication

4.3.3 Observations & Key Learnings

The interesting outcome of this prototype was the juxtaposing of audio (generative soundscapes) over the morphing of the generated visuals. Additionally, the timer serves as a feedback system for notifying the user that a change in visuals can be expected. The timer overlayed on the background soundscape, masks the waiting time, i.e., the time taken for the AI model to generate the images. This exploration was also a continuation of the first and second prototype where I worked with similar prompts rather than shifting the narrative to the creation myth story, as the primary focus was on developing a real-time communication between TouchDesigner and Max/MSP and creating generative soundscapes. The outcomes of this prototype with further modifications were a key element for creating a computer-human feedback system and generative soundscapes for narrative cohesion in the final exhibition.

4.4 Evaluation of the Prototypes

Based on the learnings from the contextual reviews and on the subjective understanding of the literature, parameters were derived for guiding the iterative process of developing the prototypes. Throughout the development process, each stage's outcomes were evaluated based on parameters such as Tangibility, Narrative Coherence, Integration of Generative AI, and User-AI collaboration. Through this comparative analysis, key learnings and insights were drawn to identify the scope and limitations of each prototype. Learnings from this analysis enabled the making of the First Installation and further refinement of the components for the development of the final exhibition (discussed in detail in the following section).

Rating the Prototypes				
Prototype	**Tangibility**	**Narrative Coherence**	**Generative AI Integration**	**User-AI Collaboration**
Prototype One Tangible Objects in collaboration with Generative AI for scene building	High	Low	High	High
Prototype Two Morphing Generations: Dynamic animation exploration	Moderate	Low	High	Moderate
Prototype Three Exploring Sound feedback + Integrating Sound into Interactive Environments	High	Moderate	High	High

Table 4.2 : Rating the Prototypes

Subjective analysis of the Prototypes				
Prototype	**Tangibility**	**Narrative Coherence**	**Generative AI Integration**	**User-AI Collaboration**
Prototype One Tangible Objects in collaboration with Generative AI for scene building	The test was highly dependent on the tangible objects for the creation of the scenes, with the intention of developing artefacts that could eventually be adapted to the Creation myth narrative	The test was able to create varying storyboard-like frames based on the theme, serving as a good starting point to help visualize the individual scenes and understand the treatment of the AI-generated images	The test was highly dependent on the generative AI model for the creation of the scenes. Pre-defined themes as text prompts and parameters for controlling the AI model were set as constraints	The level of engagement was higher than expected, the users were keen on experimenting with the artefacts to exploring the extent of what the AI model could generate
Prototype Two Morphing Generations: Dynamic animation exploration	The objects were required for physical interpretation of the scene	Movement and animation are used to create a dynamic visual experience, bringing the characters/ elements in the frame to life	The test was highly dependent on the capabilities of the generative AI model for creating a diverse range of iterations and variations from a single input	The dynamic morph through subtle reveals, engaged the user in the hidden features/ elements in the frame
Prototype Three Exploring Sound feedback + Integrating Sound into Interactive Environments	The artefacts do not directly co-relate to a specific sound but are required for scene creation. Without the objects only the background sound is played	The component of sound was required to create a cohesive narrative and an engaging user experience	The test was a major success as the communication between Stable Diffusion, TouchDesigner and Max is real-time, creating a real-time timer to be triggered when the generation is initiated	The level of engagement was similar to that of the first prototype, the added layer of sound kept the engagement levels high

Table 4.3 : Subjective analysis of the Prototypes

4.5 Visualizing The Gond Creation Myth – First Install

In this iteration, moving forward with the learnings from the previous prototypes, the primary focus was contextualizing the story and incorporating the Gond Creation Myth into the experience. So far, the prototypes have focused on developing the elements that would be modified in the context of the creation myth narrative. The process began with the selection of a segment from the Gond Tribe's creation myth. Rather than focusing on the entire story, 3 scenes were extracted from the script to demonstrate the proof of concept for the final exhibition. The tangible objects were redeveloped; since the AI model works better based on color, form, and composition, the new objects redesigned for the creation myth narrative. A colour scheme was extracted from the story and selectively used to symbolize the characters and elements from the story. The materials used for creating this prototype were cardboard and coloured cardstock paper.

4.5.1 Modifying the parameters of Stable Diffusion

With the newly created objects, and the script; a few tests were conducted to understand how the model translates the scene along with the specific line of script as a prompt. The other parameters that allow the control over the Ai-generated output are Seed, Iterations and Guidance. Seed is a random number that is assigned to initialize a generation, although this does not directly relate to a particular image, controlling the seed number helps in generating reproducible images. Iteration is a parameter that controls the number of iterations an image goes through in a generation process based on the input image and the text prompt. The guidance scale is a parameter the effects how closely a generated image follows the text prompt; for example, lower the number the model has more agency over creating the output, while for a higher number the output closer to the input prompt. It helps in balancing the creativity and adherence to the text prompt and the input image. Depending on the complexity of the prompt, this number is adjusted to generate a

desirable output. Adjusting these parameters helped in generating responses that were balanced between realism and abstraction, keeping the outputs close to the selected moments from the narrative.

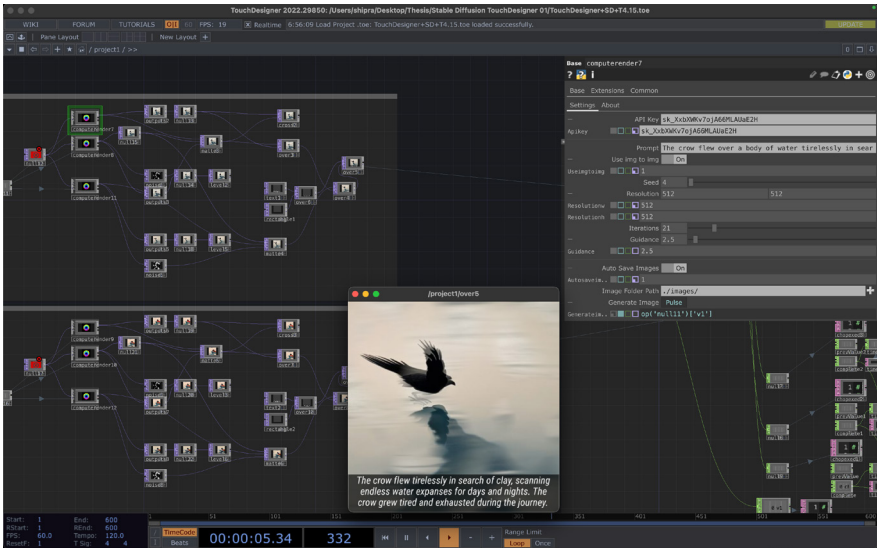

Image 4.11 : Snapshot of Stable Diffusion Parameters tab in TouchDesigner

4.5.2 First Install Setup

The first installation[1] was set up in the Graduate Gallery space at 205, Richmond St W, Toronto. The installation consisted of 1 short throw projector, 1 laptop (with inbuilt speaker), 2 display plinths; one for holding the tangible artefacts and one mounted with a web camera for building and capturing the scenes, 2 low height plinths; one used as a stand for the projector, the other as a stand for a laptop(running the TouchDesigner pipeline), printed poster's describing the installation, the Gond creation myth narrative and a set of simple instructions to guide the user, existing spot lights in the gallery space were controlled for managing the lighting in the space. The set up was accompanied by a set of posters which conveyed an outline of the Gond Tribe and their creation myth narrative, the script, and a set of basic instructions for guiding the users through the interactive experience.

1 Video link: https://ocaduniversity-my.sharepoint.com/:v:/g/personal/shiprab_ocadu_ca/Ee_g2L3rV_RFgbvFX-ejR1_YBwNNQB_p7FYDH6JhpLUNppA?e=tCtQQG&nav=eyJyZWZlcnJhbEluZm8iOnsicmVmZXJyYWxBcHAiOiJTdHJlYW1XZWJBcHAiLCJyZWZlcnJhbFZpZXciOiJTaGFyZURpYWxvZy1MaW5rIiwicmVmZXJyYWxBcHBQbGF0Zm9ybSI6IldlYiIsInJlZmVycmFsTW9kZSI6InZpZXcifX0%3D

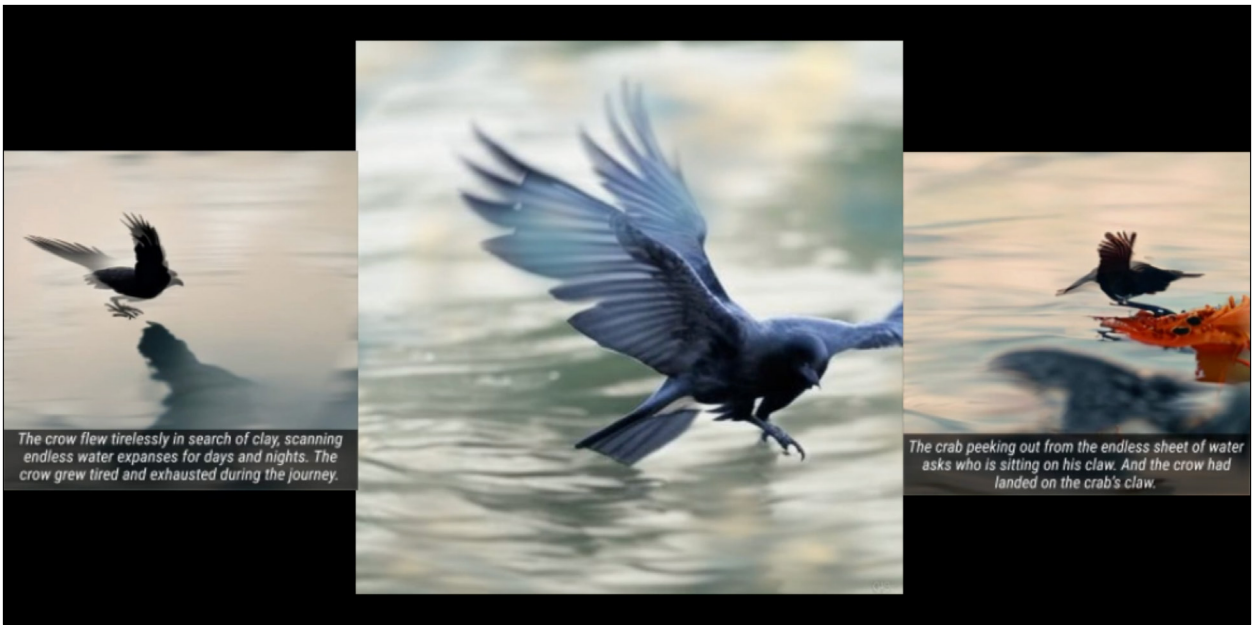

Image 4.12 : Snapshot of selected Gond Creation Myth, Digital visual interface

Image 4.13 : First Installation setup at the Graduate Gallery, 205 Richmond St W

Image 4.14 : Participant visualizing the scenes using the objects

The scenes were set up so that the user sees projected visuals accompanied with the script for that scene of the previous and next frame from the selected segment of the Gond creation myth. These were prerecorded frames developed before the prototype installation using the same objects. The goal was to let the user imagine and interpret the narrative that unfolds between these two moments. It was an interesting experiment, as the user is not aware of the prompt used to generate the scenes allowing for a more open interpretation of the scene. I was keen on understanding the dialogue between what it means to prompt a human vs prompting an AI model. The narrative progression is visible when the user interacts with the objects to create the scene on the plinth and the generated output is projected between the previous and next scene. A timer function was also set up for the generated scene to be reset to a blank frame after 25 seconds. This was done notify the user that they can rearrange or remove the objects from plinth to create a new visual for the same scene.

4.5.3 Observations & Key Learnings

The layout of the projected visuals in the format of three frames (previous, current, and next scene), highlighting the larger frame that corresponds to the plinth (with the camera feed) worked well with conveying the idea how the scenes created on the plinth translate to the generated visuals. The visuals and the sound worked well together creating an interesting viewing experience for those who did not interact and were spectators.

The prompts used in the AI model were the same as the script of the story presented to the user in the format of a poster. The intent was to prompt both the human and the generative AI model with the same text, creating a scope to critically analyze what it means to prompt a human vs a system that is made to think like a human.

Key feedback received from this set up was to know how a user can navigate through the narrative and understand which point of the story are they currently at. Seeing all the variations of the scenes that were generation for just a single scene from the story, the users were keen on seeing a gallery view of all the iterations and scenes created by user. This allows audiences to compare how they have interpreted the scenes alongside previous creations. Taking this forward, I would be able to refine this installation further to create more seamless transitions through the narrative, allowing each iteration to allow room for the user's creativity and interpretation of the story.

4.6 Final Installation Development

The development process of the final installation is divided into 3 stages. First, the incorporation of physical computing interfaces; A button (for users to initiate the image generation), a forward button and a back button (for scrolling through the scenes of the story). Second, development of the digital interface of the projected visuals. Lastly, fabrication of the display plinths and the tangible objects.

4.6.1 Physical Interface Development

Until so far, the generate button control was not provided to the user. As the users were done creating the desired scene using the objects, I would manually control and initiate the image generation. A physical button is embedded in the plinth where the users interact with the tangible objects. The reason is to allow the users to control the generation process as and when desired. Two buttons are also embedded and mapped to the change of scenes. This allows the user to navigate and scroll through the scenes and select a segment of the story to unfold. Through physical computation techniques using Arduino Uno R4, the serve serve as intuitive interfaces for the user to seamlessly navigate through the story and initiate the generation of the scenes.

4.6.2 Digital Interface Development

Building on the digital interface built for the first installation, further developments were made to refine the composition, size, and placement of the storyline text with refence to animated frames. The layout of the animated outputs is in the format of three frames (previous, current, and next scene). In addition to the frames and the storyline text, visual cues were added to indicate the user on the initiation of the generation process and the loading of the visuals. Inspired by the affordances of a traditional film strip, the visual language and layout is designed to provide cues to a user that they can navigate and pause at specific segments to explore the story.

4.6.3 Fabrication

The last step for the development process included the fabrication of a plinth and the tangible objects. The reason for fabrication and customizing the plinth was three-fold; Firstly, to host all the electrical equipment such as the projector, laptop, wiring and the web camera (along with the web camera mount). Secondly, to create inbuilt features to hold the physical computing elements such as the buttons on the top surface of the plinth. Lastly, to create an extended top surface to hold the tangible objects beside the defined area for creation of the scenes. Tangible objects were also redeveloped with an added colour palette for aiding the creation of characters and other elements from the Gond creation myth. The style of the objects remained the same, adding slight depth to the base shape and an offset to the coloured sheets on top, creating the illusion of floating objects while placed on the plinth. The offset also eased the act of picking and placing the objects on the plinth.

4.6.4 Final Exhibition: Crafting Narratives

Crafting Narratives is an interactive installation that invites visitors to engage with the Gond Tribe’s Creation Myth from India. This installation merges generative storytelling with physical artifacts, offering a unique exploration of narrative creation

through the application of Generative AI. As visitors step into the installation, they view the dynamic projection on the walls, depicting two scenes from the myth (previous and next). Visitors are encouraged to interact with the tangible objects, selecting and placing them on the dedicated creation are on the plinth. As visitors curate their own arrangement of objects, they become active participants in shaping the narrative journey.

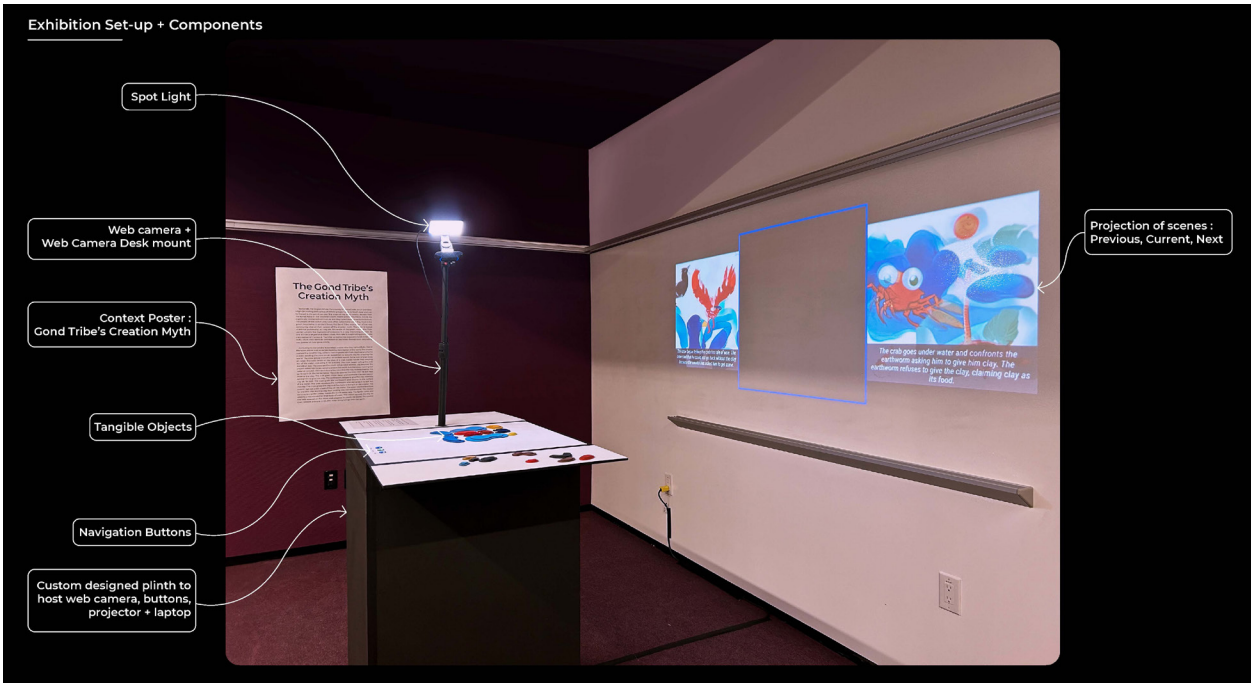

Image 4.15 : Final exhibiton set-up highlighting the components

As visitors observe the two scenes projected on the walls, they are prompted to imagine and interpret the narrative that unfolds between these frames from the creation myth. After the initiation of generating the visuals based on their creation, they are prompted to reflect on the connection between the AI-generated visuals and their interpretation of the story. Through active participation, collaboration, and critical engagement, visitors are encouraged to explore the potential applications of AI within their own creative practices.

Image 4.16 : User's engaging with the interactive installation

Image 4.17 : Interactive Installation set-up : Plinth, Tangible objects, Analog buttons (Navigation + Generate), Instructions (for user), Web camera, spot light, Projection

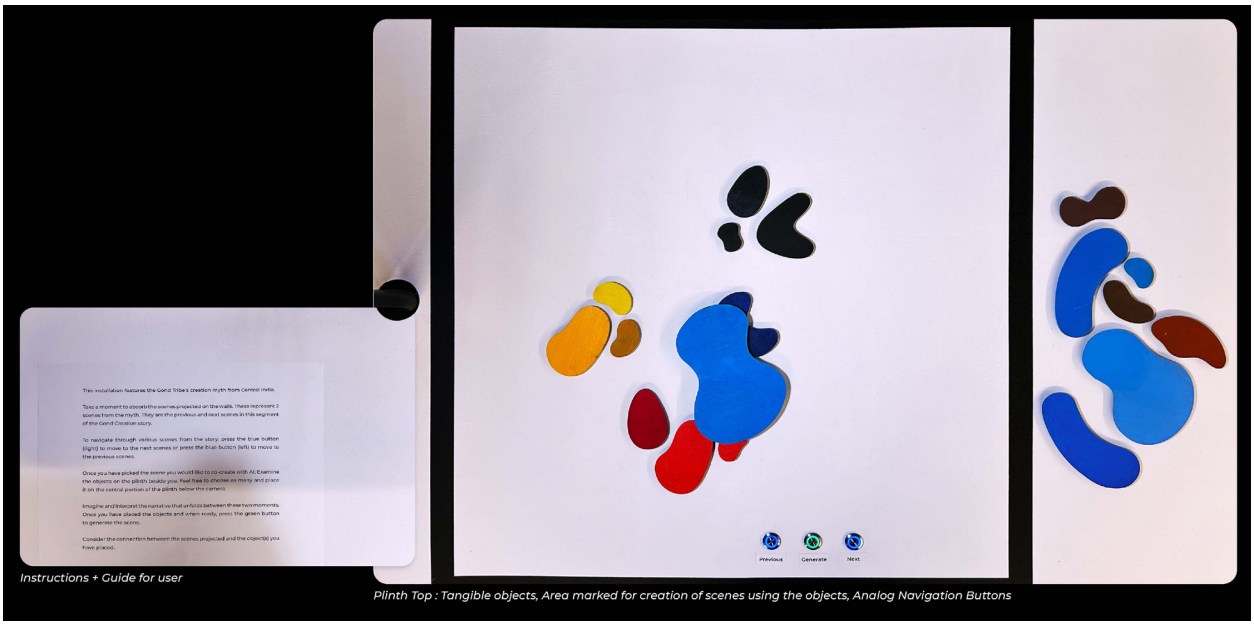

Image 4.18 : Plinth Top : (Right) Tangible objects, Area marked for creation of scenes using the objects, Analog Navigation Buttons, (Left) Instructions + Guide for user

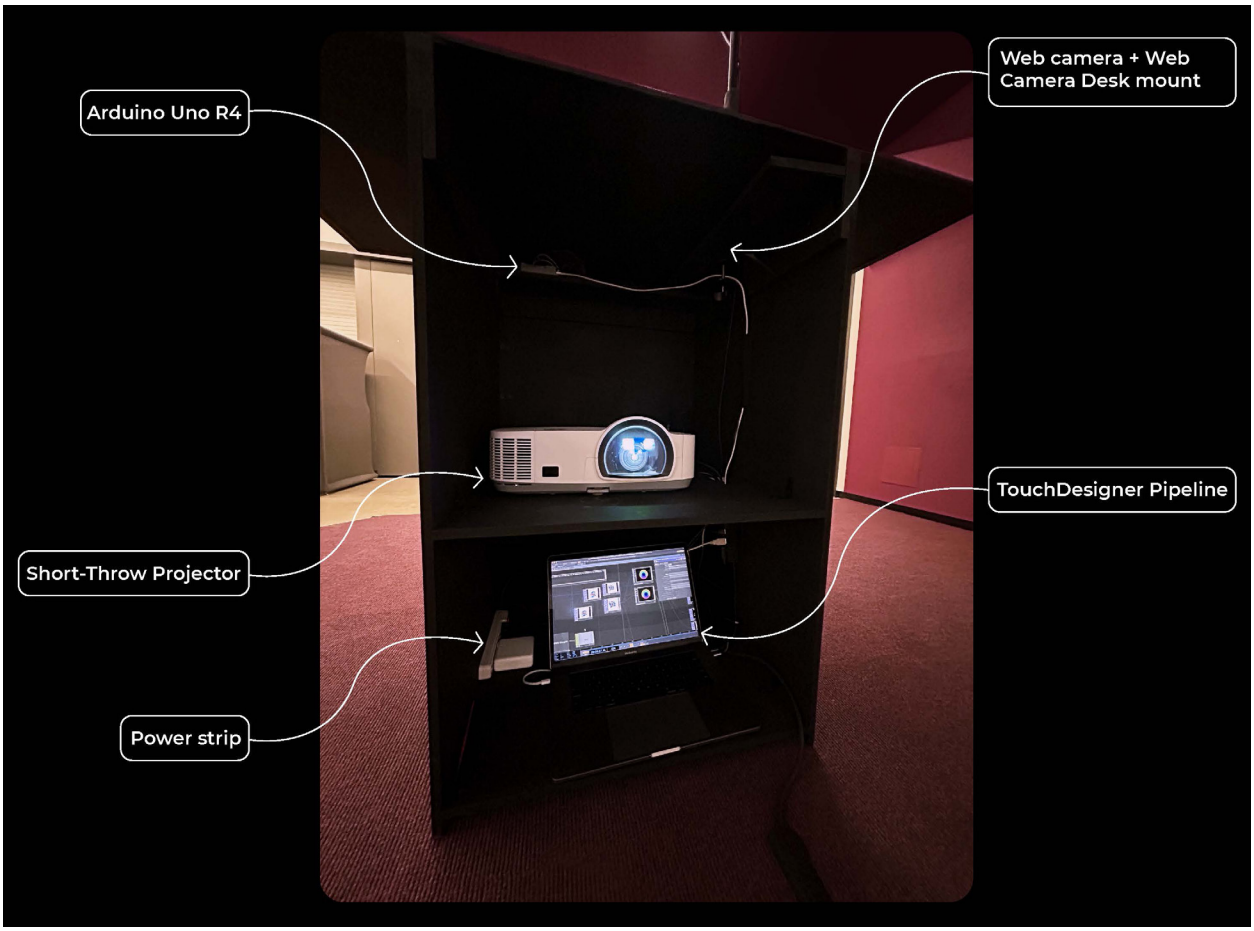

Image 4.19 : Plinth set-up highlighting the components

Image 4.20 : User engaging with the installation and co-creating with AI

Image 4.21 : User engaging with the installation and co-creating with AI

Image 4.22 : View of User's creation using the objects and the re-imagined generative visuals

Image 4.23 : User engaging with the tangible objects to build a scene

Image 4.24 : User engaging with the installation and co-creating with AI

4.6.5 Observations & Key Learnings

The spatial layout allowed audiences to be around users who were interacting and view their creations while waiting for their turn to interact with the installation. After interacting and conversing with visitors on the first day, visual markers were added on the plinth to let the users know the boundaries of the creation space and name tags for the button. Visual cues were also added to the projection of the scenes, to indicate to the user when the scene generation process has been initiated. The text prompt (script of the current scene) is also revealed along with the visual cue. This allowed the user to process and understand the missing frame from the story, while waiting for visuals to be generated.

The visuals and the sound component worked well when the installation was presented as a stand-alone piece, during the final exhibition because of noise overflowing from other exhibits, the sound cues were not that prominent. This was addressed by adding visual cues to notify the user that a change in visual can be expected.

The prompts used in the AI model were the same as the script of the story presented to the user in the format of a poster. The users were keen on knowing how the story progressed, used the navigation buttons to change the scenes and picked the frame to build using the objects. On average various users explored creating two to three different scenes and some were also keen on trying different variations of the same scene. Some users were also curious to generate various scenes using the same input, i.e., the same composition of the objects made on the table with different frames of the story.

Chapter Five:
Conclusion & Future Work

Throughout this thesis, the primary goal has been to explore the intersection of generative AI (Artificial Intelligence), storytelling, and tangible user interfaces to create engaging narrative experiences. The objectives included investigating how generative AI can applied in unconventional contexts, allowing users to co-create with Generative AI models unfolding narratives in real-time. In addition to that, I was curious about the role of tangible objects as an experimental interface AI image generation. The goal of this project was to demonstrate the potential of a technologically driven approach towards how stories can be experienced, shared, and created in real-time.

The research process involved a combination of modes within the Research Creation framework, including research-for-creation, creation-as-research, and research-from-creation. Initially, an in-depth critical analysis was conducted through literature and contextual reviews, serving as a foundation for the subsequent creative development. The primary methodology employed was creation-as-research, which involved iterative prototyping to explore, test, and experiment with different mediums, materials, and tools. Simultaneously, an evaluation of the prototypes was conducted, drawing insights from the research-from-creation mode. The learnings gathered from this evaluation informed creative decisions and shaped the direction of the research.

Primary Research Question: How can tangible AI objects act as collaborative interfaces for users to co-create with and create new forms of generative storytelling?

By combining tangible interfaces with generative AI, the project creates an engaging narrative experience that encourages active participation and reflection from the users. By blending traditional storytelling elements with real-time visual generation, the interactive audio-visual installation contributes to the exploration of new modes of narrative expression and audience engagement. Prompting both the human and the generative AI model with the same text, allowed for a critical analysis of what it means to prompt a human vs a system that is made to think like a human. The hands-on exploration using objects and generative AI showed significant potential and created a new venue for investigating Human-Artificial Intelligence collaboration.

5.1 Project Reflection: Final Exhibition

The intent for creating an interactive installation was to allow users to freely create and co-create with the generative AI tool. While observing the users interact with the installation, it was very interesting to see how they started making connections between what they have created and how the AI model has re-interpreted their creation in the context of Gond Creation myth. The engagment levels were higher and progressed with time, once they started getting familiar with the creation process. Interestingly, a larger group of the visitors were keen on experimenting with creating various versions of the same scene. For example, creating the scene using just a single object or using objects of a particular colour.

Within the context of this thesis, the creation myth narrative emerges as a powerful metaphor that blurs the conventional boundaries, prompting us to question: who truly is the creator? Is it the human user, wielding the generative AI model

as a tool, or is it the AI model itself, with its intricate algorithms and capacity for autonomous generation? Moreover, the diverse outputs generated by each iteration underscore the universality of creation myths, revealing how these narratives manifest in varied forms across different cultural and contextual landscapes. This exploration not only sheds light on the dynamic interplay between human agency and artificial intelligence but also emphasizes the fluid nature of storytelling traditions, wherein multiple versions coexist and evolve over time.

In this research the intersection between generative AI, storytelling, and tangible user interfaces, user agency emerges as a critical aspect. Collaboration, within this framework, signifies a symbiotic relationship between users and generative AI models, where both the users and the model contribute to the creation of the visuals. Co-creation takes collaboration a step further, involving active participation from users alongside AI models in generating narratives in real-time. Control plays a nuanced role, as it involves not only technical manipulation of AI model but also the negotiation of agency between users and AI. By combining tangible interfaces with generative AI, the installation allows users to actively shape the Gond creation story, thus enhancing their sense of agency. Through this collaboration, users become co-creators, engaging in a dynamic dialogue with generative AI to craft stories in an exploratory space. Although certain parameters such as text prompts, guidance levels, iteration numbers are predefined by the author, Control in this context, manifests as a balance between guiding the AI model's output, based on what the user is creating and allowing the users to experiment, explore and discover.

Observing various users interact with the installation was extremely heartwarming. The users can be categorized into three categories: First group, users familiar with generative AI tools and have previously had the opportunity to explore the tools. Second group, users who are aware of various tools and have not had the opportunity to explore. Lastly, those who are apprehensive and not very

comfortable with using AI tools. Surprisingly, the last group of people were a little apprehensive in the beginning, with time and as they saw others creating the visuals, they were very curious and interested in engaging with the objects. They were keen on understanding how the pipeline is set up and were excited to see the application of AI models in a creative and story-based environment. Prompting both human and the AI model with the same text allows for a critical examination of the differences in response and interpretation between human and machine intelligence. The hands-on exploration using tangible objects and generative AI demonstrates the potential for effective collaboration between humans and artificial intelligence, thereby creating new avenues for narrative expression and audience engagement.

5.2 Restating the Scope and Limitations

The scope and limitations of the project were defined based on the themes of tangible user interfaces, storytelling, and generative AI. Due to time constraints and practical considerations discovered during prototyping experiments, the exploration of tangible objects was focused on two-dimensional abstract forms instead of everyday or three-dimensional objects. Similarly, the initial intent to incorporate various versions of creation myths from diverse cultures was narrowed down to working specifically with the Gond tribe's creation myth. This decision was made to serve as proof of concept demonstrating the use of storytelling to encourage community engagement and cross-cultural learning.

Regarding the generative AI component, the project acknowledged the rapid evolution of AI technologies and aimed to utilize currently available tools while recognizing the potential for future advancements. Ethical considerations surrounding AI image generation, such as copyright, transparency, and creator responsibility, were also addressed. Due to technical constraints and budget limitations, the exploration of AI models was limited to those compatible with local processing on TouchDesigner. These considerations guided the project's direction and informed decisions about

which aspects to prioritize and explore in depth.

5.3 Future Works

Crafting Narratives has the potential in several key areas for further research and development:

1. A near-future work would be to incorporate more features into the tangible objects as interfaces; looking into the potential of each object is associated with a specific scene, character, or the plot of the story. Further research could delve into the possibilities of three-dimensional objects for creation, navigation, and exploration of the story.

2. The incorporation of an 'AI narrator' exploring the potential of other generative AI models for enhancing the narrative experience. This could create a more immersive and engaging experience for the user and a spectator not actively participating in the interactive experience.

3. Further work could also explore the potential of incorporating more than one story in the experience. Going back to the initial intent of incorporating various versions of creation myths from across interesting scope enabling users to engage with diverse cultural perspectives.

4. As the field of AI continues to evolve, future research could explore the integration of advanced generative AI models with interactive storytelling experiences. This could potentially lead to a space where the user can create their own story in real-time using the objects. Further research could investigate the potential of allowing users to have more control over the parameters within the AI model such as text prompts, iterations, seed number, and guidance scale.

5. Future research should continue to prioritize ethical considerations and responsible AI practices in the development of interactive storytelling experiences. This includes addressing concerns related to ownership, fair use, transparency, and creator responsibility when utilizing AI-generated content. Further development in pre-training models with a more culturally rich and inclusive dataset could potentially navigate these ethical challenges and ensure inclusivity, diversity, and cultural sensitivity in AI-generated experiences.

In conclusion, “Crafting Narratives” represents a step towards reimagining storytelling in the digital age, inviting audiences to become active participants in the narrative creation process. By embracing the convergence of art, technology, and culture, this project seeks to inspire curiosity, dialogue, and reflection on the possibilities and implications of AI-driven storytelling. In the ever-evolving landscape of AI technology and with development of newer modes of narrative expression, “Crafting Narratives” serves as a catalyst for further exploration and discovery in the evolving landscape of interactive storytelling.

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Appendix

Open Research Repository Digital File

Title: Crafting Narratives: Exhibition Installation

Description: A video documentation of various users interacting with the installation taken at the Thesis Exhibition held at the OCADU Waterfront Campus from 4th - 6th April 2024

Date: 18 April 2024

File Name: Crafting Narratives Video Documentation

File Type: .mp4