

# The Memory of a Tree; an Interactive Visual Storytelling Installation

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## **ABSTRACT**

Over the centuries, people have combined fields, leading to the creation of new domains. For example, artists have used technology to widen the range of their medium to express ideas in new ways. Similarly, technology has leveraged art to expand its range of application. Both art and technology continue to inspire innovation in each other. A contemporary example of this process is evident in the interactive art era; this article covers this topic focusing on tangible interface pieces. There have been many compelling demonstrations that involve tangible interaction to increase audience interests through their embodied interaction. However, most existing approaches are limited to engaging a user's immediate, temporary experience with setting some context of the environment with story elements. This article presents an interactive installation that engages the audience, building an immersive environment based on the synergy between embodied interaction and storytelling in a more active and meaningful way. It is based on the belief that tangible interfaces have the potential to convey narratives more meaningfully based on physical interaction and human senses and fundamentally aims to supply another potential of tangible interfaces to spark further discussion in this area.

**Keywords:** *Interactive Art; Tangible interfaces; Embodied Interaction; Interactive Narrative; Computer/Digital Art;*

## **1 | INTRODUCTION**

Tangible interaction has been inspired by many different disciplines, and accordingly, it acknowledges a wide range of theoretical and practical contributions. This article argues that tangible interfaces can intensify audience immersion and explores how interactive non-linear storytelling can leverage this potential. The paper is structured as follows: the next section reviews theoretical background and related work focusing on an historical review of interactive art installations, which served to inspire the current paper; following this is a description of an interactive visual storytelling installation, 'The Memory of a Tree'. The core focus of this prototype is on the design of the content, which intends to provide its audience with a novel experience through combining interactive visual narrative with embodied interaction and tangible structure. The piece also provides an opportunity for participants to communicate with one another by interacting with the prototype, and impacting the visual stories simultaneously. Overall, it aims to create an artistic experience that bridges the 'virtual' and 'real' worlds within its immersive environment.

## 2 | BACKGROUND AND RELATED WORK

As tangible interfaces embody both cyberspace and physical structures, they need to provide the connection between these different spaces. I believe that by experiencing digital computation via tangible interaction, the audience can be engaged with higher immersion; tangible systems will support a stronger connection to storytelling than traditional screen-based systems, which will help to bridge the gap between the physical world and cyberspace within the field of multimedia storytelling (Mazalek, Davenport, & Ishii, 2002). Accordingly, tangible interaction offers the potential to strengthen an experience with the designed concept through the immersive nature of the environment, and particularly, it can present several levels of meaning at one moment (Shaer, 2009). Moreover, experimental studies have demonstrated that physical mobility can increase user creativity and suggest that less constraining interaction styles are likely to help users think and communicate (Klemmer, Hartmann, & Takayama, 2006). In other words, physical interactions were highlighted as a powerful mechanism to increase the level of engagement and modify the way that people engage with a particular experience (Bianchi-Berthouze, Whan, & Patel, 2007). Supported by such aspects, tangible interaction has increasingly extended its boundary.

Storytelling is a fundamental part of human nature that spans many centuries of evolving practice. How we present and share stories has developed rapidly from its origins in the physical environment (such as around campfires and on the stage) to the printed page and more recently to movie, television and computer screens (Mazalek, & Davenport, 2003). Besides this general trend, the use of tangible elements for storytelling also has a long history. Indeed, from the theatre stage to daily interpersonal conversations, people use objects as tools to improve communication by posing, gesturing and describing the story with and around the objects.

The idea that traditional storytelling mostly incorporates responses from its audience, combining interactivity with storytelling is far from new. Indeed, interactive storytelling, which involves not only advances in interactive technologies, but also new modes of media content production has been a long-term endeavor to build more immersive environments for the audience (Cavazza, Lugin, Pizzi, & Charles, 2007). Considering 'immersion' is a metaphorical term derived from the physical experience of being submerged in water, people enjoy the movement out of the familiar world, the

feeling of alertness that comes from being in a new place, and the delight that comes from learning to move within it. Relying on the enjoyment of immersion likened to 'digital swimming' as a participatory activity (Murray, 1997), the reason why interactive storytelling, which allows people's participation, can bring such amusement can be more persuasive.

In the field of interactive art, Christa Sommerer and Laurent Mignonneau exhibited 'Interactive Plant Growing' (1993), which became one of the milestones in this area. It invited the audience to get close to the installed plants and enabled the digital interaction to show a fascinating and magical scene on the projected wall by touching the plants (Stocker, Sommerer, & Mignonneau, 2009). Masaki Fujihata ([www.fujihata.jp](http://www.fujihata.jp)) also presented a pioneering piece, 'Beyond Pages' (1995), an interactive book that connected digital contents on the screen to physical environments. It explored the potential of new interfaces allowing the audience to trigger feedback in the real world. Furthermore, in 1999, when 'Text Rain' (1999) was shown by Romy Archituv and Camille Utterback ([www.camilleutterback.com](http://www.camilleutterback.com)), it extended the idea about involving participants as a part of the installation where people used their body (the physical elements), to lift and play with falling letters on the projection screen (the cyberspace). Following this thread, Scott Snibbe ([www.snibbe.com](http://www.snibbe.com)) involved participants' shadows as part of the installation for 'Deep Walls' (2002). The installation recorded people's shadows viewed within one of sixteen small rectangular cupboards, looping indefinitely. As more art pieces embrace interactive technology as an expressive medium, the scope and space for bridging between the concept and interaction have evolved in diverse ways. Golan Levin ([www.flong.com](http://www.flong.com)) and Zachary Lieberman ([thesystemis.com](http://thesystemis.com)) with Ars Electronica Futurelab ([www.aec.at](http://www.aec.at)) developed 'Interactive Bar Tables' (2004) where digital organisms reacted to the participant's touch or objects on the table. It successfully formed the cyberspace as another immersive live space and it increased people's immersion by active participations in relation to digital creatures. Yunsil Heo and Hyunwoo Bang ([www.everyware.kr](http://www.everyware.kr)) also created such a digital live environment, 'Oasis' (2008), a surface covered with black sand which turns into a pool full of life when participants move sand away. In this way, diverse experiments have been conducted to explore how interaction techniques can be designed to be more intuitive, and how the boundary between the digital contents and the real world can be more natural in the context of one another. However, despite the distinguished

literature cited above, most pieces involved storytelling more as a context setting to involve embodied interaction within the designed theme reasonably. In this paper, the potential of a tangible interface to support an interactive storytelling system in a more active and meaningful way will be demonstrated.

### 3 | PROTOTYPE: THE MEMORY OF A TREE

Tangible and embodied interaction (TEI) is an established field of research and design practice that focuses on the implications and new possibilities for interacting with computational objects within the physical world (Horneoker, 2001). The prototype introduced in this article has been developed to explore mechanisms for leading audience members not only to experience storytelling through the digital contents on the screen visually but also to enable communication with each other by interacting with the physical structure. To achieve this, the system is based on the concept of relating and connecting the digital contents of the cyberspace to a real world element, represented by a tree branch. Figure 1 shows the final prototype device.



**FIGURE 1** | Display of The Memory of a Tree.

#### 3.1 CONCEPT

Tangible interfaces offer both direct familiarity and a set of common metaphors that can be leveraged for interaction (Klemmer et al., 2006). In this installation, the branch is installed to play the role of the mediator between cyberspace and the physical reality as a part of the physical installation. Through the branch, which exists as a familiar object in our daily lives, audience members will approach the installation with curiosity. Participants place their hands on the handprints depicted at the top of the structure and look at the digital contents on the screen visualized through the shadow animation of the tree, and imagine its lifetime in a poetic mood.

#### 3.2 INTERACTIVE VISUAL NARRATIVE

When inactive, the installation features one dead (physical) branch and its (digital) shadow. When participants place their hands on each of the four zones at the top of the installation an animated story is displayed in the same shadow style as the tree. The four stories can be watched separately or, if multiple hands touch the sensors simultaneously, they overlap one another according to the times and durations of the hand contact.



**FIGURE 2** | Participants take a look at the digital contents while putting their hands on the top of the display to control the story.

The initial inspiration of this work is the artist's personal memory of holding hands with her grandmother who was suffering from Alzheimer's disease, which leads the memories of the patient to emerge in seemingly random patterns. While holding hands, the artist's grandmother kept sharing her disorganized subconscious thoughts, which provided a window through which to imagine her life despite its fragmented sequence. This experience strongly influenced the initial concept instantiated in this prototype. The shadow of the tree is intended to represent the subconscious memory of the tree and through activating and watching the four different chapters of the story, the participants and spectators can imagine the life of the dead branch, the object that exists in physical reality.

In this prototype, the four stories that can be triggered show a girl reading a book under the tree, the lifetime of the tree from the its growth until its leaves fall, a pair of birds meeting each other on the tree and flying away and a group of children around the tree.

As multiple sensors can be activated at once, it also allows various scenes to be played concurrently, such as the girl reading a book under the growing tree or a pair of birds flying together while the children play around the tree. Accordingly, the in-

stallation allows participant members to cooperate with each other to simultaneously activate chapters of the story at once in order to overlay narratives. This process enables the participants to experience a unified and connected feeling not only with the installation (via the physical contact it requires) but also with the other participants who collaborate to generate their experience together.



**FIGURE 3** | Each story can be triggered by four different sensors and can overlap.

Furthermore, as each story progresses over time, activation of the different sensors at various times will cause the narrative to unfold differently. Even if the same sequences are activated, for instance, the girl reading a book under the tree and the lifetime of the tree, the girl could be reading the book under the growing tree or amid the falling leaves. In this way, the participants may repeatedly engage with the installation in order to experience the full diversity of these subtly different moods.

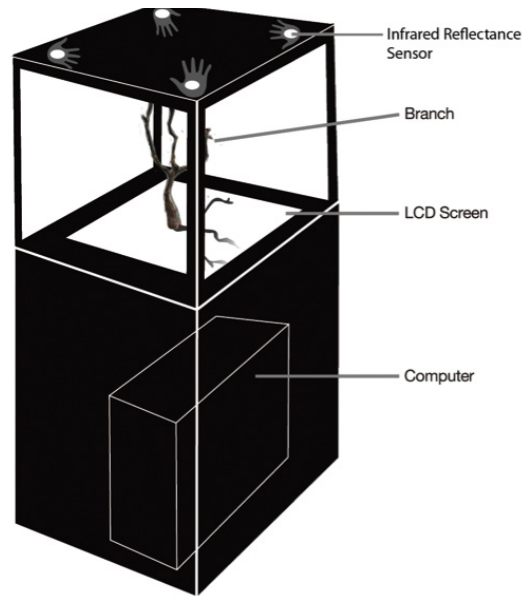
### 3.3 SYSTEM CONFIGURATION

The entire system is designed for the audience to be actively engaged in the experience in a poetic mood rather than having them appreciate the technology passively by highlighting the sensing and interaction system. Consequently, the technical aspects are concealed in order to have the audience focus on the visual narrative, which is shown on the LCD screen. To accomplish that connection, an LCD monitor displays the digital contents masked with a wood frame and four infra-red reflectance sensors were placed underneath the handprints located on the top of the prototype. Inside the base of the prototype are a computer and an Arduino ([www.arduino.cc](http://www.arduino.cc)) board that captures information from the sensors and transmits it to the computer. This information is received and the digital contents are displayed via a custom program written in the open source programming language, Processing ([www.processing.org](http://www.processing.org)). The goal of positioning the handprints directly above the infrared reflectance

sensors (which detect when people touch the handprints) was to visually indicate how to operate the system in order to minimize the need to provide explicit instructions or training.

### 3.4 FUTURE WORK

Some comments received from participants suggested that the installation may provide the digital contents not in one fixed angle, but in more varied angles. This feedback gave the opportunity to consider rebuilding the cyberspace as a 3D world for future work. By rendering the shadow effect live as the output of 3D modeling, it would be possible to display a range of different shadows, originating from different light-sources and viewing angles - for example, depending on where the participant is standing. The value of this idea would also allow us to involve larger numbers of participants standing at various angles if a larger version of the prototype is made, intended for display in a public space.



**FIGURE 4** | The system map of the installation.

Furthermore, creating different versions of the installation with the same footage would demonstrate the effectiveness of implementing multiple interactive options as a way to merge interactive narrative contents with tangible interfaces. For instance, comparing the duration that participants stay at the piece or contrasting their reactions when only one chapter of the story is available against when several chapters are visible may provide insight into how increased levels of interactivity can impact the participants' and spectators' levels of immersion.

## 4 | CONCLUSION

Tangible interfaces give physical form to digital content and this supports enhancing levels of immersion. This article asserts that empowering audiences to explore interactive contents with embodied interaction through tangible interfaces and such environmental aspects strengthen both participants' and spectators' experience of the art piece. Its potential has broadened possible application areas and storytelling can be described as part of its compelling domain.

This article has presented one prototype, an interactive installation of a visual narrative entitled 'The Memory of a Tree'. The system is an experimental approach to using tangible interaction as a visual storytelling tool for artistic expression. It focused on how physical structure with embodiment can contribute to engagement with interactive storytelling in a more meaningful and active way. The piece was developed based on background research indicating that creating immersive environments supported by tangible interaction and interactive storytelling engages and immerses the audience. I hope this prototype and research can offer one case study in this thread to facilitate future discussions on the synergy between tangible interfaces with embodied interaction and interactive visual storytelling, impacting the interactive art field.

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