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Cemigram: Integrating Tech with Tradition in Cemeteries

Abstract

This project proposal investigates user experiences and design implications for integrating technology into cemeteries to enhance memorialization and engagement while preserving their traditional solemnity. Using semi-structured interviews, speed-dating, and participatory co-design activities, twelve unique individuals with diverse connections to cemeteries shared insights on their technological preferences for remembering the deceased. Findings reveal that while users see potential in unobtrusive tech like holograms, audio guides, and mobile AR, they express concerns about preserving cemeteries' natural, tranquil atmosphere and commercialization, among other examples. This study's results indicate that effective cemetery technology designs should allow familial personalization and promote meaningful interactions while preserving the cemetery's ambiance. This research provides insights into designing cemetery technology, highlighting the importance of minimal disruption, environmental compatibility, and sensitivity to personal and cultural needs while also drawing attention to the built environment of the cemetery. In future steps of this work, I will use the design recommendations from user interviews to design a digital hologram cemetery installation, or "Cemigram."

Introduction

I first thought of my idea of a “Cemigram” four years ago when visiting a cemetery with my grandparents, planting American flags on veterans’ tombstones for Memorial Day. At the gravesite and in the following weeks, I began to consider how remarkable it would be to commemorate the dead in ways that extend beyond the typical items we link with cemeteries: names, tombstones, and dates of birth and death. Many seemingly "ordinary" lives are filled with fascinating histories, yet these stories are mostly missing in cemeteries. For example, I never knew my great-grandpa as he died months before I was born. But from my grandpa’s stories, I have learned he was a fascinating man who flew in a B-17 Flying Fortress bomber and met Winston Churchill during World War II. What if there was a way to bring his stories and appearance to life to learn more about him?

To this end, I first employed speed-dating, a design research method in between sketching and prototyping, with six participants. After gaining clarity on the gaps in knowledge I needed to tackle, I conducted semi-structured interviews with six participants about their experiences and orientations towards cemeteries, followed by a short co-design activity. These research activities revealed that while participants were interested in potential unintrusive cemetery technologies, they expressed concerns over violating the cemetery’s tranquility, implicating that Cemtech should focus on preserving the cemetery’s ambiance at utmost priority, among other examples. Lastly, I lay out how I plan to use these results to inform the design and development of my proposed project, the Cemigram.

This class has led me to develop further what the “Cemigram” would physically look like and what needs it would fulfill. Creating a "Cemigram" would involve gathering historical records, family narratives, and any available digital media with participant coordination and then using advanced technology to represent the deceased digitally. While my original intent was to remember the dead by learning from their mistakes and successes to create a better future, I realize there is a secondary intent to establish an emotional connection with loved ones who may not have known them before their passing. The idea of my “Cemigram” only grew in the wake of a few months after a friend’s passing in 2022. Through this capstone project, I hope people will

learn more about their ancestral past and take it upon themselves to comprehend their ancestors' lives and improve their future.

Background Research

Overview of Cemeteries

For my project, it is first essential to understand the context of cemeteries in the U.S.: what cemeteries are and what purposes and roles they have served historically and in modern times. I focus on cemeteries in the U.S. as that is the site of my research and my proposed implementation plans. I would like to begin by defining the word "cemetery." The word cemetery can trace its origins in the Greek word for 'sleeping place," as land meant for the burial of the dead (*Warner)*. With the definition stated, it is crucial to comprehend the evolution of cemeteries in the United States. In the United States, the rural cemetery movement began around the 1830s, with the first rural cemetery being Mount Auburn in Cambridge, Massachusetts, in 1831.

During this rural cemetery movement, it was popular and familiar to hold picnics in local cemeteries as cemeteries were the closest thing to a park for accessibility for many people, especially in urban areas. These rural cemeteries usually had elaborate entrance gates meant to separate the living world from the dead, denoting that visitors were entering a place of tranquility and serenity. Furthermore, these cemeteries had large swaths of grass for relaxation, extravagant statues and headstones, and even maps and guidebooks for visitors (*Overstreet)*. Throughout the 19th century, many children died due to epidemics, and women died due to childbirth, making death too common for families. Because of these circumstances, death was seen more lightly, with it being viewed as a gentle slumber and cemetery visits being an accepted social norm to keep the deceased loved one close to the family. Not only was the visitation acceptable, but a picnic to include the deceased loved ones was as well. Over time, many urban cemeteries outlawed public gatherings and consumption of food because large crowds left behind a lot of litter. By the end of the 19th century, burial grounds connected with churches were viewed as unsanitary and crowded, resulting in hundreds of burials on small land plots. At that point, in heavy rain, coffins sometimes broke open and spilled into streets, popularizing the idea of designing large cemeteries more like parks.

In recent decades, cemeteries have returned to their roots of inviting the public back to the grounds to rediscover the historical park-like areas of the cemetery (*Warner)*. The more modern version of a cemetery is called a memorial park, with the difference being that there is less emphasis on death and more on memory. Compared to older cemeteries, memorial parks are stark, with fewer visitors. This is a uniquely American trend because the older population rarely passes away at home and is less linked to family, where people seldom go to cemeteries unless for a funeral. Green Burial is another cemetery ritual that is growing in popularity, where no chemicals or embalming are involved, or vaults or sealed caskets to delay decomposition. Cultural norms change over time, and we must respect this evolution. Cemeteries have historically served as spaces for public use and leisure. Therefore, when designing technologies for cemeteries, we need to protect and accommodate various types of activities, including but not limited to mourning.

Design Guidelines for "CemTech"

Previous researchers have coined the term "CemTech" to refer to technology implementation at cemeteries. Academic and commercial projects have considered why people visit cemeteries and how technology could enhance people's experiences of cemeteries, with support for the relevance and acceptability of technologies in the context of cemeteries.

The following source (Straka et al.) focuses on urban cemeteries, why people visit them, and their preferences. This study sought to understand the reasons behind cemetery visits, preferences for cemetery features, differing greenspace preferences, preferences of nature elements as comforting experiences, and how reasons for the visit relate to the respondents' preferences. The results of this study were that the respondents' primary reasons for visiting cemeteries were, among other things, "enjoying nature," "mourning," and "historical interest." They also strongly preferred the cemetery features of wildlife, solitude, and vegetation, noting the strong influence of nature on cemeteries as a preference.

One speculative design research study (*Hirsch et al.)* provides vital design guidelines for cemetery technologies that are relevant to this work, including:

1. Technologies and interfaces should encourage people to engage with existing surroundings.

2. The technologies' design should respect the dead and the tranquility of the cemetery's atmosphere. They should be either temporary in nature or designed and maintained to last.

3. Technologies should comply with the cemetery's code of conduct, not disturb other cemetery users or passersby, and respect the cemetery as a place to mourn and reflect on the deceased; they cannot transform cemeteries into amusement parks.

The table below provides an overview of this study's findings (*Hirsch et al., pg.153*).

Group		Design Recommendations	Description	Reference
Contextualization	R1	**Preserve through Modern Technology**	Modern technologies such as, e.g. VR and AR support revealing and communicating hidden information non-invasively and facilitate the learning about the place's significance.	e.g., [20]
	R2	**Embed Interfaces for User Engagement**	Embedded interfaces enable the place to proactively and spontaneously trigger onsite interactions independently from the user or any brought devices (such as, e.g. Step into my Shoes).	e.g., [16]
	R3	**Foster User Awareness**	Interfaces should engage people with the surroundings by slowing them down and guiding their attention towards certain cemetery characteristics to increase their awareness.	e.g.,[41]
Timelessness	R4	**Respect the Deceased**	Showing content from past ages related to the deceased was appreciated but should not personify any of the characters, e.g., by simulating interaction with the ghost of a deceased.	e.g., [31]
	R5	**Enhance the Place's Atmosphere**	Historical cemeteries represent timelessness and are appreciated for their peaceful and natural atmosphere, which should be enhanced and supported.	e.g., [37]
	R6	**Design for the Temporal Course**	Transience and decay are relevant themes in the context of historical cemeteries. Interfaces should adapt to this aging process or serve as temporary installations only.	new
Code of Conduct	R7	**Support Local Code of Conduct**	Historical cemeteries are sensitive design spaces where the user behavior should comply with the local code of conduct to achieve a more homogeneous experience among place users.	e.g., [8]
	R8	**Consider Passers-by Perspectives**	When deciding on the interaction modalities, the outside perspective of passers-by should be considered. For example, voice user interfaces, e.g., might be perceived strangely and give users an uncomfortable experience.	e.g.,[32]
	R9	**Balance the Entertainment Character**	Balance the level of entertainment to avoid turning cemeteries into amusement parks. Interfaces should support their role as a community place and a place to mourn and remember the deceased.	e.g., [26]
	R10	**Avoid Public Humiliation**	Acting against the local code of conduct disturbs other place users and should be regulated. However, the regulation should avoid public humiliation.	new

In a similar vein, another study (*Allison et al.)* identified three key features that can help make technologies in cemeteries more socially acceptable:

1. Technologies should extend existing memorialization practices rather than create new ones.

2. Technologies should cater to families and friends, not others who do not have a personal connection with the deceased.

3. Technologies should maintain the peaceful atmosphere of a cemetery; noise and conspicuous activity could disturb this tranquility.

Thus, in my work, I plan to abide by the guidelines established in these two previous research projects.

In addition to exploring existing writing and research on cemeteries and associated technologies, I conducted a comparative analysis of different cemetery technologies. For the other technologies I found, I will summarize each source, discuss in which ways they abide by or violate the CemTech design recommendations identified in the two studies I discussed above, and compare and contrast these technologies to my own proposed plans.

Works of CemTech

The first source I will discuss is a YouTube video titled Digital Headstones: Grave Headstones Engage Digitally with Mourners *(TRT World)*. In this video, there is a digital headstone where you can upload multimedia presentations. The headstone has a sensor that, if no one is around, simply shows the person's name and birth and death dates. However, the headstone automatically activates the multimedia content when someone stands in front for 4-5 seconds. A smartphone app can also take the deceased person's social media accounts and make them interactable from its content. What is peculiar about this installation is that some of the elderly are particularly impressed by the digital headstone's wealth of information, and it is only worth $3,000, which is 40% cheaper than a conventional headstone. According to the aforementioned design guidelines, this technology is inconspicuous because it only shows information when interacted with. However, relying on social media accounts raises potential privacy and maintenance concerns. It also does not seem to allow users to opt out of viewing digital content if they are nearby, which might violate the peace of the cemetery experience.

The second source discusses cemeteries equipped with technology, such as virtual cemeteries and video gravestones *(Ramos)*. For instance, there are virtual tours of famous cemeteries, such as Arlington Cemetery. The Les Corts Cemetery in Barcelona, Spain, plans to introduce a search system that will enable gravestones to be found using a large touch screen. A practical example is digital tombstones with QR codes on headstones, where you can learn information from your phone, emulating an online sanctuary with a bridge between the early and online worlds. Overall, there are plenty of technological ideas to revolutionize the cemetery space, whether to make it more sustainable or offer an alternative method of learning from the dead. QR codes are an example of an inconspicuous technology that does not violate the norms and atmosphere of a cemetery.

An article expands on using QR codes in cemeteries to keep the deceased's memories alive and discusses its concerns (*Landsberg*). Asian, Danish, and Austrian cemeteries have QR codes featured on stone memorials for visitors to access information about the deceased. QR codes are a virtual space where loved ones exchange stories, photos, and memories. While they have discussed QR codes for at least five years in Germany, they still have not become accepted and commonplace in German culture. This article points out two problems: data protection and the possibility of disturbing the peace with the QR codes. To better explain, some people feel that the QR codes could violate new data protection guidelines regarding postmortal personal rights as they are not legally binding. As for disturbing the peace, Michael C. Albrecht, responsible for media on the board of the Association of German Cemetery Administrators, states, "Cemetery culture is not static; it continues to develop." He believes that as long as the QR codes do not disturb other cemetery visitors, cemeteries should adopt technology so people know them better. While already addressing that QR codes are a silent technology that can enhance the cemetery while simultaneously not disturbing its environment, there are still concerns about data protection and fear of technological change in the cemetery.

The self-guided tour of Oakland Cemetery in Atlanta, Georgia, provides another non-technological enhancement to the cemetery experience and has influenced a later technology project based in the same cemetery *(Historic Oakland Foundation)*. This tour has fifty-nine stops throughout the forty-eight acres of Oakland Cemetery, where you can purchase and download a printable map and tour the cemetery at your own pace. What is also intriguing is that this is an

audio-guide tour of sorts where you hear the brief history of the cemetery, the most common symbols found there, and the stories of Oakland's most famous residents buried there. While what I am talking about next is from a different source, it still pertains to Oakland Cemetery. An additional article explores the mixed-reality experiences in Oakland Cemetery and how it focuses on location-based mixed-reality experience design *(Dow et al.)*. Like my intent, this cemetery's objective is to educate visitors about stories relating to the deceased residents of the cemetery. What is expanded upon in the audio-guide tour aspect is that there is a dramatic narrative where voice actors play as the cemetery residents and tell their stories throughout the time they lived. Moreover, what is peculiar too is that the main narrator of the experience guides guests to various gravesites where the guest can choose from numerous categories of content using a handheld controller while using the cemetery's physical environment. In this way, the technology follows the design guidelines for using technology that encourages interaction with the existing physical environment of the cemetery. Plus, the audio-guide tour does not disturb the norms of the cemetery as it uses headphones to listen to the tour, connecting with the cemetery's stories and respecting its solitude.

The last source I will discuss today is another YouTube video, Inside the Japanese graveyard of the future! | Japan With Sue Perkins - BBC about a futuristic Japanese graveyard *(BBC)*. To discover your deceased relative, you just have to search for them on a touch screen, where a "Butsudan" lights up with an urn of ashes. The narrator, Sue Perkins, was surprised that it still felt contemplative and spiritual despite its futuristic appearance. The woman featured in this video also gave valuable points for storing their remains in the digital graveyard: a conventional cemetery is expensive, and she does not have children, so there will not be anyone to take care of her grave. However, she also felt she did not feel connected to her late husband, who was in the graveyard. Sue also pointed out that in this graveyard, compared to her cemeteries in England, there was a "democratization of death" where everyone was the same whether they were rich or poor, famous or not. This source highlighted how thoughtfully designed technology can enhance a cemetery experience and improve equity and accessibility. In line with the design guidelines discussed previously *(Allison et al.)*, this work focuses on the needs of the families and loved ones of the deceased. While promising to memorialize the deceased, the futuristic graveyard failed to establish an emotional connection between the deceased and loved ones, which I am attempting to implement in my future work.

To conclude my background research, it appears that I am far from the only one thinking of revitalizing the cemetery. There are many intriguing ideas for remembering the dead, from digital headstones of multimedia content to QR codes found on headstones to display information about the deceased to even a futuristic Japanese graveyard with lighted-up Budistans. There were also findings discussing the user needs of the cemetery: one of solitude and full of nature and the other of how technology does not disturb the peace unless it distracts visitors. The issue is that a cemetery is solemn and should be respected, which makes implementing technology more complex. Therefore, it is imperative to respect the cemetery's code of conduct and tranquility when implementing technology that focuses on a touchy subject like death. Moreover, technology can be used if it allows loved ones to connect with their deceased and engage with the environment. As a result, when conducting my capstone project, it is critical to comprehend the design guidelines, especially maintaining the cemetery's peaceful atmosphere, establishing a connection between loved ones, and encouraging engagement with the cemetery's surroundings.

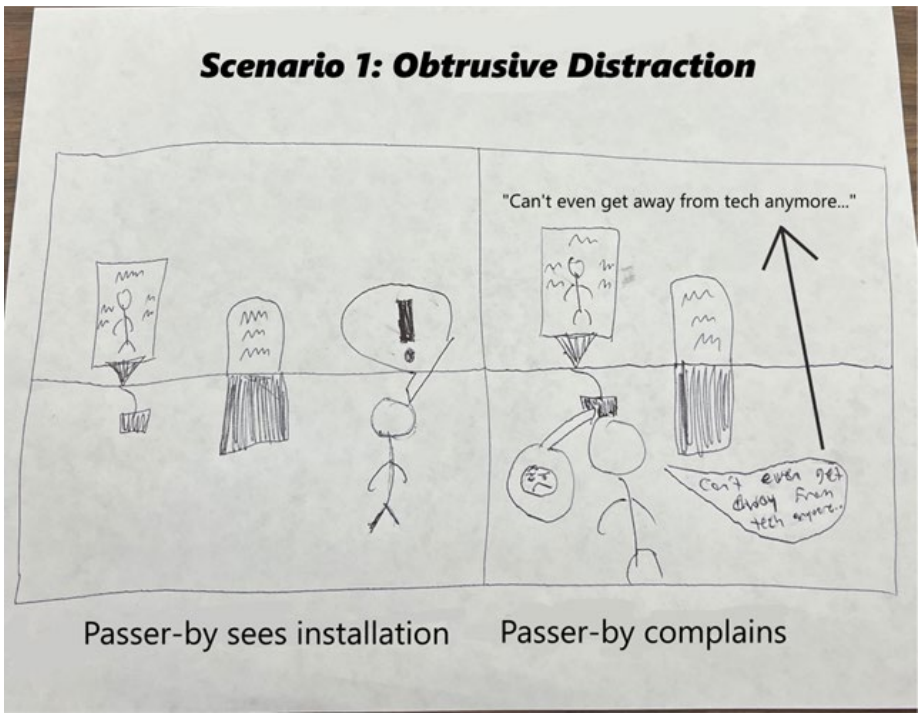
The Speed Dating Method

The speed dating method is a research approach that presents many potential ideas to a target audience without being too attached to any single one. The technique allows individuals or a research team to receive early feedback during ideation about user needs. Speed dating also encourages boundary-pushing, attempting to determine where users' comfort levels lie by pushing against those boundaries (*Zhao).*

I conducted two speed-dating sessions, one in class with my peers in the Immersive Media (IMM) program and another out of class. For the in-class session, I prepared four different storyboards to understand better users' desires to learn about deceased relatives and users' comfort levels with various aspects of potential designs, such as displaying a 3D likeness of the deceased. Six people, including my professor, participated in this first speed dating session. The storyboards from the in-class session can be seen below. After slightly revising the four storyboard scenarios, I also conducted an additional speed-dating session with a peer outside the class. I asked participants to imagine themselves in each scenario, react, and discuss how accurate it was and how each scenario made them feel. The four scenarios draw out

different aspects of cemetery technologies and attempt to push against different boundaries and use cases. Specifically, I focused on perceptions of obtrusive or distracting technologies (Fig. 1), family-based cemetery experiences (Fig. 2), individual cemetery experiences (Fig. 3), and comfort levels around animated technology experiences (Fig. 4). I discuss the participants' responses, and then summarize the key takeaways below.

Figure 1



- **Concern about Cemetery's Serenity**

  ○ Participants expressed concern that cemetery visitors probably did not sign up for the installation; they were there to see their deceased relatives and not see a hologram shoved in their faces. Participants emphasized that you must be considerate of other people who do not use the hologram because they would most likely want to mourn without technological interference.

  ○ Almost all participants expressed that the hologram would disturb the cemetery's serenity.

○ Participants felt technology could ruin the cemetery's peace because the cemetery is a sanctuary for mourning and solitude.

- **Concerns about Equity**

  ○ Some participants worried about whether distributing the holograms would be equitable at cemeteries, as they would likely require financial resources. They wondered why technology might be present at some gravesites and not others. They feared that such technology could heighten the importance of a chosen few and diminish the importance of those who did not have technology installations.

  ○ Several participants expressed that they would prefer to experience the installation outside the cemetery to not disturb existing cemetery dynamics and expectations.

Figure 2

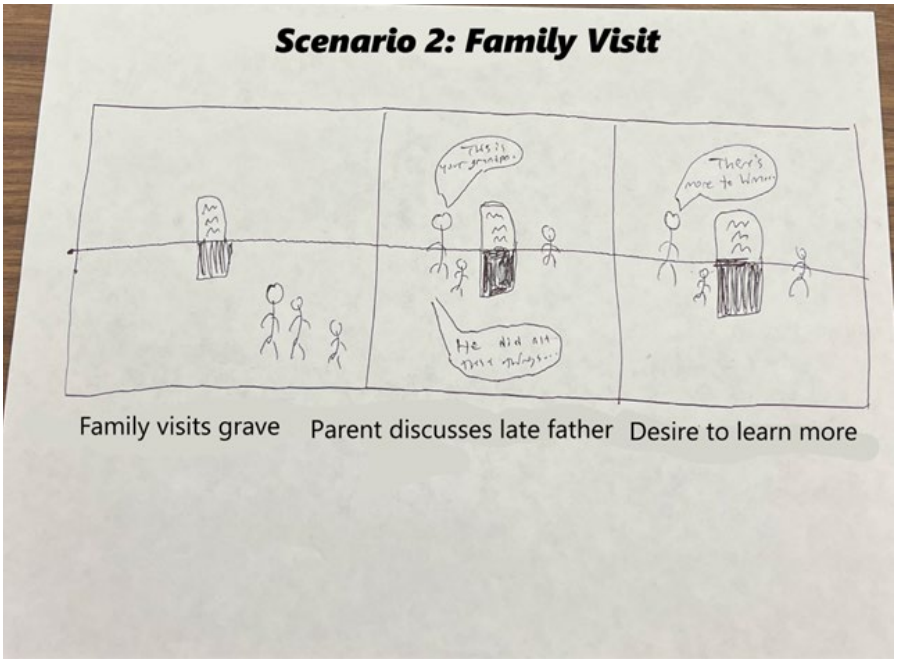


Figure 3

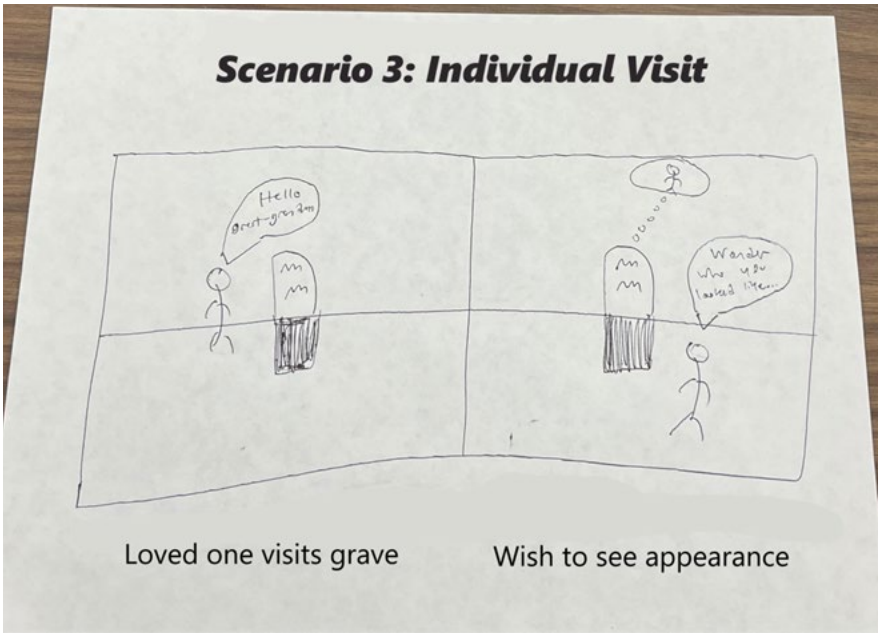


Figure 2 displays a family visiting the cemetery with their child for their deceased grandpa, and Figure 3 shows an individual visiting the cemetery alone.

- **Desire for Learning about Passed Loved Ones**

  ○ The idea of learning about ancestors and their stories resonated with participants.

  ○ However, many participants expressed concern that discussing and learning about the deceased could violate unspoken cemetery norms of silence for the dead. Participants said their families spoke of deceased relatives' and ancestors' stories in home settings. They expressed higher comfort levels with alternative locations for a technology solution, such as the home or a more neutral indoor space like a warehouse.

Figure 4

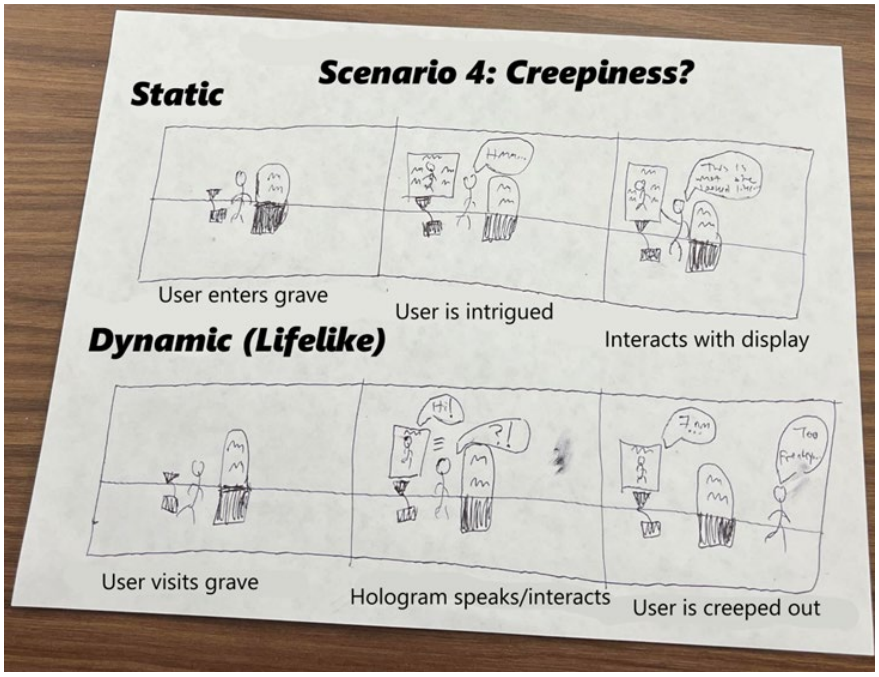


Figure 4 shows two contrasting scenarios to push against what users might perceive as creepy, uncanny, or otherwise uncomfortable: dynamic and static installation. A static exhibit simply displays text and an appearance, while a dynamic one shows animations and a speaking 3D model of the deceased. There were numerous intriguing responses to this storyboard.

- **Artificial vs. Authentic Media**

    - All participants expressed varying levels of concerns about and discomfort with the use of artificial media. Participants did not want the hologram to speak audibly unless the speech came from pre-recorded video or audio of the deceased; they were concerned that talking technology would be inauthentic and could disrespect the dead. They also expressed a desire for familial consent for the hologram. Moreover, they feared the hologram would violate cemetery norms and disrupt its serenity and tranquility. They expressed greater comfort levels with a static 3D appearance over a dynamic version.

In this first storyboarding session, participants identified strongly with the desire to learn more about the dead, especially deceased relatives. Still, they expressed varying levels of

discomfort with the technology involved in the scenarios. Most participants expressed deep concern about disrupting the sanctity of cemeteries and were uncomfortable with producing artificial reconstructions of the deceased's appearance or voice. I used this feedback to modify the storyboards for my second session.

The second speed dating session involved one individual, a fellow student at my university majoring in Data Science/Math. I continued using the storyboards from the previous session but modified their presentation to incorporate some of the feedback from my first sessions. Specifically, in my revised storyboards:

- The hologram does not emit unless the user activates it.
- I omitted using artificial media, such as animations or AI-generated voices.
- I incorporated more user interactions at the cemetery and beforehand (i.e., not talking at graves) to gain insights into orientations around discussing and learning about the deceased.
- I explicitly included family consent for media, such as voiceovers from the deceased and pictures.

In my revised version, the hologram does not emit unless the user activates it so that I can understand more nuances of users' comfort levels with the proposed installation and how they might relate to levels of control of the installation. Moreover, I discontinued the possibility of artificial media because there was powerful pushback on 3D animations of the deceased and AI-generated voices. I also chose to modify the interactions more realistically, as some participants pointed out that you would not really talk at a cemetery and would rather talk about the deceased beforehand or afterward. Lastly, in contrast to artificial media, authentic existing media, with the family's consent, is acceptable because it can add a layer to the deceased individual without dishonoring their memory. With these changes put in place, the storyboards from this session focused on perceptions of and boundaries around disruption in a cemetery, desires to learn about deceased relatives and ancestors, and comfort levels in different proposed locations, such as a museum or warehouse in addition to the cemetery.

Figure 5

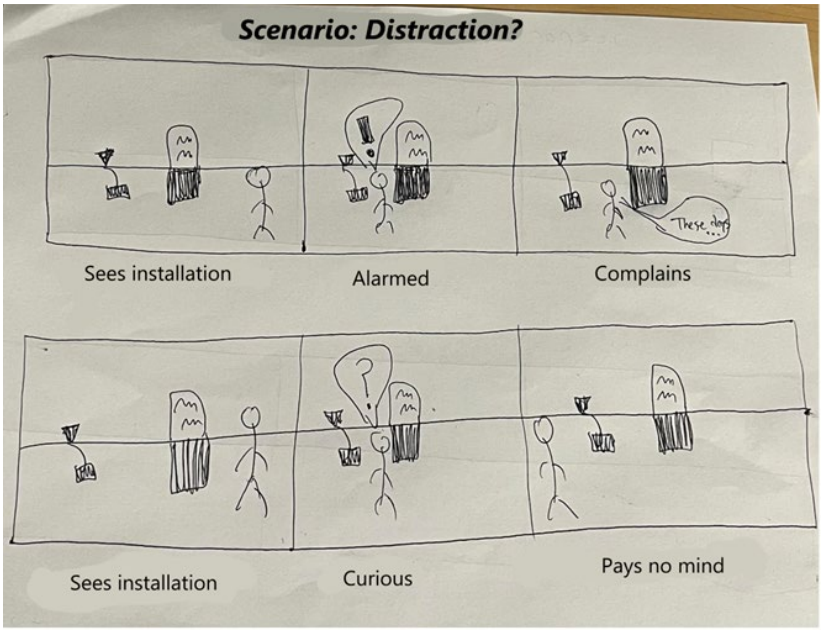


Figure 5 concentrates on two potential reactions to the "Cemigram" at the cemetery: one of alarm and one of curiosity.

- **Curiosity vs. Alarm**

    - The participant said he is more likely to be curious than alarmed by the projector because he is inquisitive about what the projector shows. He says he would be more likely to use the pressure plate (plate that activates the installation) if he notices it at the cemetery. The participant stated that the technology is potentially intrusive for some people. The participant expressed a desire to have ancestors' stories inspire others as it inspired him throughout his life. He also noticed a mismatch between the scenario depicted and his own experiences, stating that the projector is not on your mind if you are in the present moment and focused on reflecting on the deceased.

Figure 6

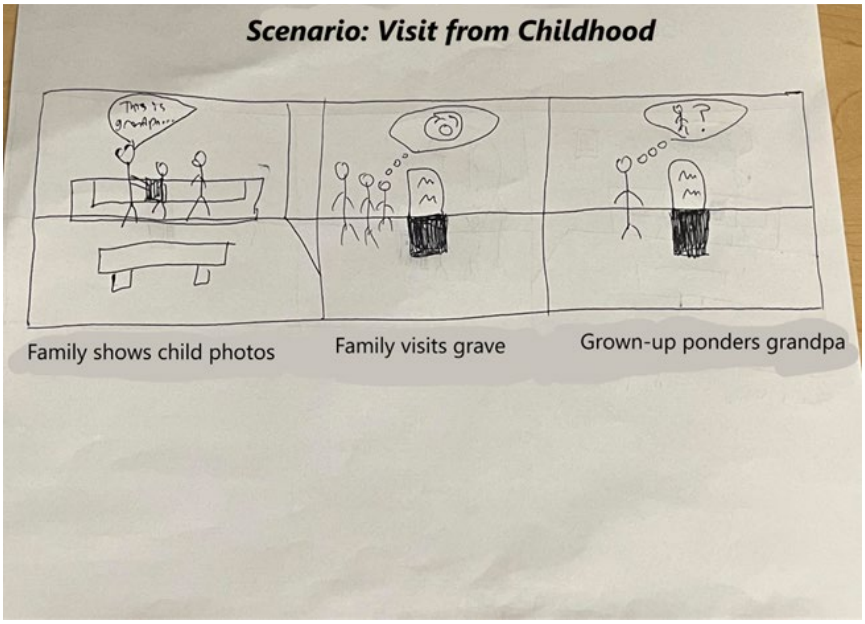


Figure 6 focuses on a previous experience from a participant of the first speed dating session: a child not caring about their deceased relative until they have grown more mature and older. A note I will make is that all my participants in both speed-dating sessions have recently entered their twenties. Hence, their needs and interests may have changed over time, and it is worth exploring a more comprehensive age range to discover new perspectives.

- **Childhood Cemetery Experience**

○ The storyboard resonates with the participant as he is curious about his grandparents and wants to learn more from a visual perspective. As an adult, he wonders who his ancestors really were, as he never knew them.

Figure 7

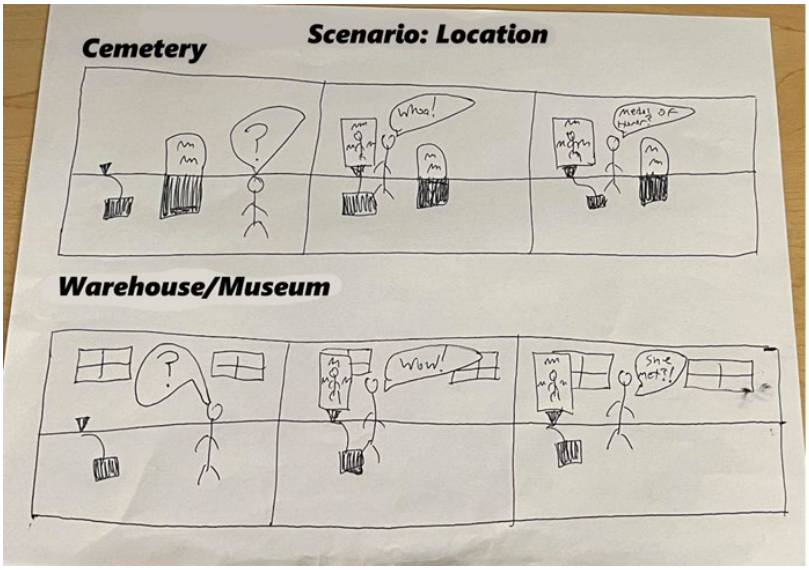


Figure 7 focuses on the location of the "Cemigram," with a similar response from the depicted user to see how the location of the technology might impact perceptions.

- **Location Difference**

    - Where previous respondents felt a non-cemetery location might be a more appropriate venue for technology involving the deceased when attempting to imagine himself in such a scenario, this participant felt dissonance. He stated that, most likely, you do not see your dead ancestor at a warehouse/museum after mourning at a cemetery and that it is more powerful for him to mourn and then learn about ancestors in a cemetery, given its thought-provoking and emotional ambiance. The participant expressed that famous historical figures should have their "Cemigrams" more to museums/historical locations rather than graveyards. He pointed out that he reflects and thinks deeply at a cemetery as they elicit strong feelings. As such, the 'Cemigram" should be kept in the cemetery rather than a non-cemetery location. Furthermore, to enhance the user experience, he recommended the installation act as an art exhibit with audio guides and a montage of pictures with a voiceover through Bluetooth headphones.

I noted key differences in the responses in this second speed dating session. For instance, while the participant understood that there was a potential disruption for other people of the hologram, he did not mind; he was curious about what the projector showed and wanted to learn about someone's story. Like the first session, this participant wanted to learn more about his ancestors and their stories. What surprised me the most about this session was that the participant preferred the hologram to be at a cemetery rather than in a museum or a warehouse due to its powerful emotional impact. This proves to be interesting for my project as it validates that at least a subset of participants has needs and desires around learning that interact with someone who thinks similarly to me in having people learn more about their deceased relatives at a cemetery to honor their memory. Cemeteries are public spaces, and there is a need to respect all individuals' boundaries and comfort levels while still serving the needs of the subset that wants an in-cemetery experience. For example, I could consider having sound in the hologram from a voiceover but only for headphones, so the sound does not disturb the cemetery if I take the route of a physical installation. In that case, it is imperative to make it as least intrusive and distracting as possible to avoid disturbing the solitude of the cemetery. Also, exploring non-physical installations of the "Cemigram" is worth noting to see if they are practical in fulfilling my vision of learning more about the dead, such as the Magic Leap and the Tilt-5.

Overall, both speed-dating sessions helped me tremendously in learning the perspectives of potential users. The first session especially gave me some pushback and made me consider an alternative location or make the hologram as unintrusive as possible. However, the second session gave me some groundwork for my original intention of creating the "Cemigram" at a cemetery as it would grant it a powerful emotional impact. The desire to learn more about deceased relatives and ancestors is found in plenty of people who do not have the luxury of learning about them in their lifetimes. With these new ideas and views, I feel better equipped to research more about my capstone project, the "Cemigram."

Semi-Structured Interviews

Methods*:* The research method I chose for my project is an interview and observations with a later stage of a participatory co-design activity. I selected this method to assess whether users are comfortable with a physical installation that displays visual obituaries to commemorate

their loved ones' memories and stories and how they feel about it. Through this research, I aim to understand the needs, desires, boundaries, and challenges that should be incorporated into a design. I also implemented a co-design activity where participants decided from a stack of six cards which one of them was the most appealing or unappealing, unraveling their reasoning and how they would redesign. Furthermore, I elected not to include people currently in a mourning process to respect their boundaries. It is worth noting that five of the six people I interviewed were not at a cemetery (virtual or otherwise); however, at least four have a significant connection to a cemetery (regular cemetery visitor, ancestry research, etc.).

During my research, I interviewed six participants. For anonymity, I will refer to them as p*, with a number in place of the asterisk to designate each participant. I will also briefly introduce each participant based on their demographics, such as age range, race, and gender, which are the focal points of discovery throughout this process. P1 is a Caucasian woman in the age range of 35-54. P2 is a Caucasian man in the age range of 18-24. P3 is a Caucasian woman in the age range of 18-24. P4 is an Asian man in the age range of 35-54). P5 is a Caucasian woman in the age range of 64+. P6 is a Caucasian man in the age range of 64+.

During the interviews, I took detailed notes and then reviewed these notes afterward. I used an iterative open-coding method to analyze the qualitative data I collected, focusing on emergent themes.

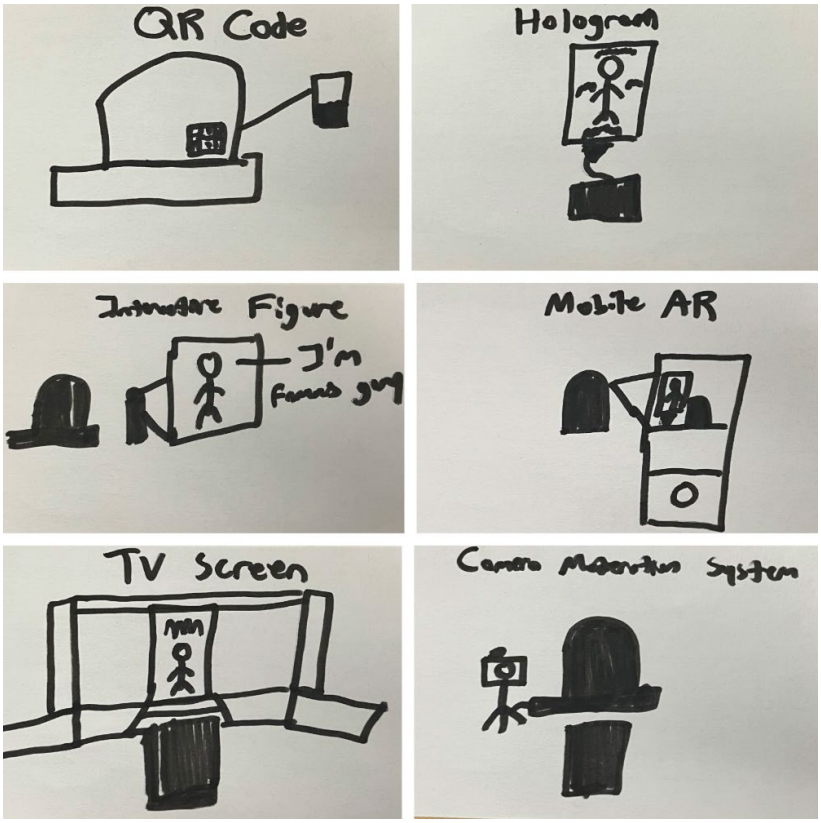
Results: The six participants I interviewed visited the cemetery at various frequencies and for multiple purposes. They visited the cemetery as infrequently as once every several years (p3) to as often as several times a week (p1). Two participants (p2, p5) visited about twice a year, and others visited 4-5 times annually (p4) and roughly weekly (p6). Some participants visited for outdoor recreation or other leisure such as walking, hiking, or running (p1, p2, p4) or for haunted tours during Halloween (p3), while other participants visited cemeteries to pay their respects to the dead (p4, p5), take care of gravestones (p5), and visit the gravestones of historical figures (p6). Traditional memorials such as gravestones also seemed to impact participants' scenery and ambiance (p4), graves signifying importance (p2), and to discover stories and gather information (p6).

Despite using cemeteries in quite different ways, in defining what a cemetery is, all participants shared that a cemetery is a place to commemorate the dead, and almost all participants (5/6) said they observe and reflect on the tombstones at cemetery sites during their typical visits. Nearly all participants also saw a cemetery as a place of quiet, peace, and tranquility, with one participant viewing it as creepy but also somewhat nostalgic due to the presence of the deceased (p2). For what is important about a cemetery, participants' answers varied wildly from nature (p1), sense of respect for the dead (p2, p3), architectural diversity and spaciousness (p4), a permanent record of people (p6), and the first place to go when grieving (p5). Participants' cultural upbringings had different effects on how they viewed cemeteries.

For instance, Christianity/Catholicism influenced three participants' views on cemeteries (p1, p5, p6). These participants discussed attending funerals from a young age and caring for the graves and stated that death, while sad, should be embraced as the next step to the afterlife. One participant (p2), who comes from a Middle Eastern background, said he makes it his goal to visit his dead relatives once a year because it is his job as a remaining family member to remember them. Another participant's upbringing (p4) had a relatively muted impact on cemeteries as it was not a topic of conversation and focus. Not until he married years later did he realize the importance of cemeteries. One participant from a sustainability background (p3) expressed that because of her work background, she viewed cemeteries both physically and spiritually: tombstones are not sustainable, and historically, the deceased returned as part of the earth. Interestingly, for the last question in the interview process, *Is there anything else you would like to say?* only the participants from the 64+ age range had something else to say. P5 wished for younger generations to have more respect for the dead by visiting the cemetery, and p6 said that life is empty when you do not know who came before you and that a cemetery is a great way to expand that knowledge.

After the interview portion, participants joined a co-design activity session. They were presented with potential cemtech designs on a stack of six cards and then asked how they would redesign these proposed technological solutions. This activity aimed to unravel the participants' reasoning in choosing which cards were unappealing or appealing and to gain further insight into their cemetery user needs. In having users re-design technologies, the goal was not to get targeted design ideas but to gain more insight into users' needs and challenges in this design

space from another angle. Below is the stack of six cards presented during the co-design activity. The top-left is a QR code, the top-right is a hologram, the middle-right is a mobile AR, the bottom-right is a camera moderation system, the bottom-left is a TV screen, and the middle-left is an immersive figure.



Before being presented with the card, participants were asked what they would add if they could enhance a cemetery. Answers varied from more nature (p1) to a lack of sensationalism (p2), better preservation of tombstones (p3), water availability for flowers and cleaning graves (p5), and a centralized object to learn more about the deceased (p6).

In terms of the actual technological choices, participants varied reasonably widely. For example, while two participants (p4, p5) saw mobile tech as most appealing due to the privacy and accessibility it would afford, three participants (p1, p5, p6) saw QR codes and other mobile-based solutions as least appealing; they did not want to be interrupted from their experience by using a mobile phone. Half of the participants saw screens as highly undesirable, viewing them as distracting, disruptive, and potentially too personal and revealing (p1, p2, p3). The hologram

card was a favorite for one participant (p1), a least favorite for another (p4) who saw it as too invasive, and a middle-ground option for several others.

What is interesting about redesigning these cards is that half of the participants chose the hologram (p1, p3, p5), with two of them (p3, p5) deeming it the second most appealing. In their re-designs, participants expressed a desire for inobtrusive technologies that respect users' specific cemetery experiences, show respect for the families of the deceased, and share information about the deceased. Indicating desires for inobtrusive technologies that place the users' preferences first, p1 wanted only audio-based, non-visual technology and the ability to pause the experience at any point, p2 desired a low-tech, audio-based guide, p5 did not want technology to overwhelm users with too much information, and p6 felt that technology shouldn't be installed in the cemetery until it is fully polished and tested. Several participants also desired visual components that show a likeness of the deceased. In this vein, p3 wanted technology that focused on how the deceased looked, and p3 felt it would be cool to see someone's face on a hologram. One participant, p6, also showed interest in exploring the lives of the deceased with whom he did not have a personal connection, stating that a central identification system would be cool to identify interesting people. Participants also expressed concern for the rights and privacy of the families of the deceased, with p4 sharing that the deceased's family should have a decisive say in telling stories of the deceased and p5 expressing that the use of technology would only be appropriate without commercialization.

Discussion: After conducting the research, I realized several implications for my capstone project. The most important one is preserving the cemetery's peaceful and tranquil environment, which is paramount. Considering that at least half of the participants advocated against using screens of any kind, it is critical to incorporate minimally intrusive technologies that integrate with the cemetery's surroundings rather than replace them. Moreover, participants exhibited a variety of preferences regarding technologies, and customization can prove to be intriguing when deciding their level of interaction. For example, a pausable feature on the hologram for a video or narration and adjustable volume for audio can accommodate these preferences. Likewise, to preserve the cemetery's atmosphere, cemtech technologies should address environmental and suitability concerns, as nature is a core tenant of a cemetery. These

considerations can be adequately addressed by focusing on eco-friendly tech installations that align with nature.

Furthermore, it is also crucial to accommodate familial sensitivity when constructing cemtech technologies. Cemtech designs should allow loved ones and the deceased before they pass to control their narrative and decide what they want to show and tell the world to know about them. The deceased and their families and loved ones should be in control of the narratives and media that are shared, and in this way, gatekeeping and privacy settings will be a crucial component of the cemtech I design. Since a cemetery is a deeply personal setting, commercialization, such as advertising and insincere storytelling, should be disallowed at all costs to mitigate the lack of sincerity and reverence of potential cemtech technologies. On the other hand, there was some concern about the lack of engagement from younger generations at cemeteries. This can suggest that engaging cemtech solutions such as a hologram can bridge these generational gaps and equally connect the young and the old simultaneously with their loved ones. When constructing cemtech technologies, preserving the traditional nature of a cemetery, including customizable interactions, addressing environmental concerns, incorporating loved ones' needs, and finding ways to engage users with the cemetery is critical.

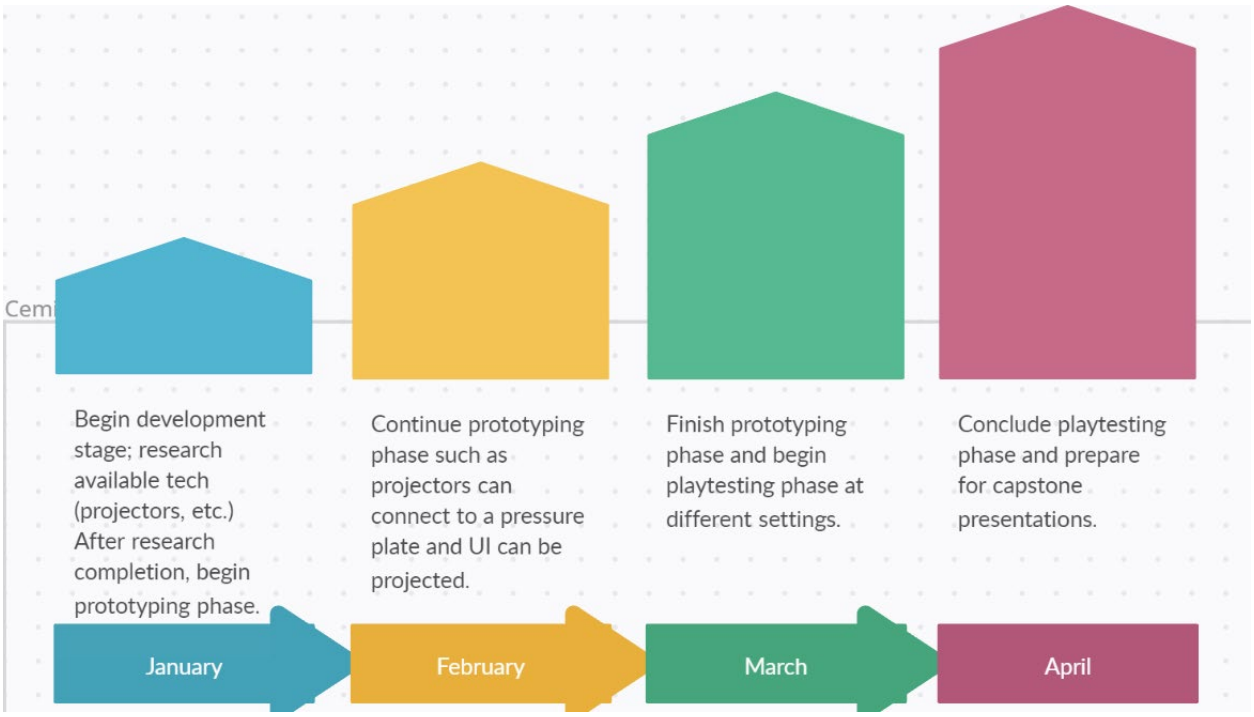
Conclusion and Next Steps

To conclude this paper, the research reveals valuable insights into integrating technology into cemetery spaces to enrich visitor experience while respecting their traditional, reflective nature. Findings indicate that visitors value personalization, privacy, and the ability to control their level of engagement with technology, such as holograms or audio guides. A strong preference emerged for minimally invasive, eco-friendly technologies that preserve the cemetery's peaceful ambiance and align with personal and cultural boundaries around mourning. My research will prove informative to anyone working in immersive media when designing within a sensitive setting such as a cemetery, especially regarding preserving tranquility without disrupting it through technological implementations. When developing technological designs in these cases, it is paramount to understand the culture, user base, and history of such settings.

Without research or comprehension, such designs will come across as tone-deaf and contradict the essence of the desired design setting.

Because of these design implications, the "Cemigram" will prioritize user control, environmental compatibility, and a sincere, non-commercial approach to storytelling. More specifically, non-commercial for me means an authentic, coming from the heart rather than for financial gain, desire to see that the “Cemigram” shall succeed. Moreover, I shall focus on nonintrusive tech, such as spatial audio for headphones, and involve families in shaping their loved ones’ narratives to appropriately tell their stories as they want to the world. These principles will guide the phase of development, which will focus on prototyping technology that adapts to individual preferences while honoring the collective reverence associated with cemetery spaces, ranging from projectors and pressure plates to 3D modeling software to project a photo likeness on a projection. Currently, these are the technologies I will be experimenting with, but they are subject to change in the future.

The " Cemigram " development stage will commence in early January 2025. From then on, I shall research the tech available in the first couple of weeks, such as projectors, pressure plates, cables, etc. Upon the completion of tech research, I will begin prototyping with said technologies. From mid/late January into February, I will continue to prototype with technology, ensuring projectors can connect to pressure plates, etc. I will finish prototyping in March by confirming it can work and fix any tech problems. From late March to the end of the semester in April, there will be a playtesting phase to test the “Cemigram” prototype with various users in different environments such as a cemetery, inside a classroom, or a museum as potential options. The “Cemigram” will be on track for completion in April 2025 for capstone project presentations to conclude my college career.


Begin development stage; research available tech (projectors, etc.) After research completion, begin prototyping phase.
Continue prototyping phase such as projectors can connect to a pressure plate and UI can be projected.
Finish prototyping phase and begin playtesting phase at different settings.
Conclude playtesting phase and prepare for capstone presentations.
January
February
March
April

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APPENDIX: Supplementary Materials

Interview Protocol

For groundskeepers:

- **Can you briefly describe your role and daily activities at the cemetery?**
  - **How long have you been working in the cemetery/as a groundskeeper?**
  - **What do you like about your job? What do you dislike? (And why).**
- **How do you perceive visitors' interactions with the cemetery?**
  - **What are some things you have observed people doing in the cemetery in the last month)?**
    - **Would you call these typical behaviors? Why or why not?**
- **Have you observed any changes in how visitors respond to gravestones over time?**
- **From your observation, how do people memorialize the dead in the cemetery?**
- **What are your thoughts on a physical installation at the cemetery?**
  - **How might it impact the cemetery's atmosphere?**
  - **What, if there are any logistical challenges, would this present for your work?**
  - **What concerns, if any, would you have about this proposed intervention?**

- **For cemetery visitors:**
  - **In the past month, how many times have you visited the cemetery?**
    - **Is this typical for you?**
  - **Think of the last time you visited the cemetery.**

- **For what reason(s) did you visit the cemetery? (probe on specifics when needed).**
    - **Follow up: Is this typical of a cemetery visit for you? (If not, ask about another time they visited the more typical cemetery—focusing on specific visits may help participants answer questions better.**
- **What did you do at the cemetery during this visit? (Probe as needed to understand).**
    - **Follow-up with typicality, like the previous question.**

■ What roles, if any, do traditional memorials (gravestones) play on your visits?

○ For everyone:

■ How would you explain what a cemetery is to someone who has never visited one before?

- **How would you describe the atmosphere of a cemetery?**
- **What, if anything, do you think is important about a cemetery?**
- **In what ways has your upbringing (culture/ values) impacted your views of cemeteries?**

■ Is there anything else you would like to say?

○ Demographic questionnaire (optional):

- **Age range: (ex. 20-29)**
- **Culture: (ex. Irish)**
- **Religious: (ex. Christian)**

· **Race: (ex. Caucasian/African American)**

Co-Design Activity:

- **What would you add if you were to enhance the cemetery?**

Cards

- **Hologram**
- **QR Code**
- **Mobile AR**
- **TV Screen**
- **Interactive historical figure**
- **Camera moderation system**

- **Which of these cards appeals to you the most?**
    - **Why?**
- **Which of these cards is the most unappealing?**
    - **Why?**
- **What would you redesign about these cards?**
- **Is there anything else you want to add regarding using technology at a cemetery?**