Understanding Automatic Conveyor-belt Columbaria: Emerging Sites of Interactive Memorialization in Japan

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ABSTRACT

Focusing on the design of technology for mourning and memorialization, we describe the emergence of Automatic Conveyor-belt Columbaria, locally developed in Japan, as an example of an interactive system combining physical and digital remains, and discuss its user experiences and social influences. It concludes with implications for future HCI research and practice with a focus on future gravesites and memorialization sites in dense urbanized regions.

Author Keywords

Memorialization; Techno-Spirituality; Design Ethnography.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

While it can be delicate and complex research area, technological trends are compelling designers of interactive systems to engage with issues related to memorialization and bereavement worldwide. Recent work has begun to explore issues such as the appropriate transfer of the deceased's digital data (e.g., [4,16]), to how technology could better support grieving processes among various stakeholders (e.g., [13,14,15,19]), to the ways in which digital content might be used in practices of memorialization (e.g., [10,12,17,18, 22]). Our paper aims to contribute to expanding knowledge in this latter theme: how digital materials in interactive systems are embodied in emerging sites of memorialization (e.g., columbarium) and the ways in which they mediate social practices of memorializing the lives of departed loved ones.

In the Human Computer Interaction (HCI) community there has been a recent emergence of work focused on designing and studying interactive technologies to support everyday

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Figure 1. A visiting booth we observed in Tokyo city area.

practices of memorialization e.g., ([18,20,26,28]); the majority of which has focused on the home context. We aim to build on and expand this work through our research on an emerging, commercialized public infrastructure for digitally-mediated memorialization practices in Japan, known as the Automatic Conveyor-belt Columbarium or *jidō hansōshiki nōkotsudō* in Japanese (hereafter 'ACC') [7,23]. ACC is one of the newest kinds of gravesites, which has massively gained in popularity in recent years in Japan. ACCs are purpose-built facilities that store many thousands of cremated remains ('cremains') in urns that are moved by a mechanized system, similar to the technology used in distribution warehouses. As of January 2018, there are over fifteen ACC facilities in the Tokyo metropolitan area alone.

Emerging technologies must be interpreted within their particular cultural and religious cosmologies of life and death, and we situate our field study in the contemporary context of Tokyo. The HCI community has increasingly become interested in understanding how interactive systems intersect with social, cultural, and spiritual practices concerning remembrance of one's dead (e.g., [17]). Japan has rich traditions of Buddhist funerary ritual and ancestor veneration; however, in urban centres, memorialization practices are rapidly shifting to become more personal, secular, and cost-effective [23,25]. To better understand people's experiences with ACCs and how they mediate social practices of memorialization, we conducted an ethnographic study at eight ACC sites from February 2016 to September 2017 in the greater Tokyo metropolitan area. This includes ethnographic observations at ACCs as well as semi-structured interviews with five administrative staff of ACCs and three chief Buddhist priests (owners of ACCs).

Our goal is to analyze these emerging socio-technical sites designed to support digitally-mediated memorialization practices. Findings revealed how ACCs interweave physical and digital remains, and how this public infrastructure shapes personal memorialization practices. Based on these findings, we conclude with implications and opportunities for future research in the HCI community.

BACKGROUND

ACCs are perhaps best described to outsiders as a mixture of a gravesite, a luxury hotel, and a goods distribution warehouse. They are multi-storey buildings, which house many thousands of cremains, which are typically stored in metal boxes arranged on rows of shelving. The metal boxes, known as "zuji" have a height and width of 300 mm, and a length of 600 mm. On the front of zuji are square, colored stone plates that are usually engraved with the family name (Figure 2). Boxes can hold two full size urns (the total remains of two persons) or more urns (up to eight) in the case of only preserving partial cremated remains. Some ACC sites also contain a temple main hall (hond \bar{o}) and rooms for memorial services. When visiting an ACC, people 'call up' the remains of their deceased by tapping an ID card to the reader (Figure 3); the system then retrieves the corresponding ashes using an automated claw and conveyor belt system, and delivers the boxes to one of the centre's many visiting booths. The ID card is issued to the contracted customer, usually a bereaved family member.



Figure 2. A typical set of shared offerings at an ACC booth; Top: the stone plate (concealing the family metal box), Sides: the vase of flowers, Bottom: the vessel of incense chips and burner.

The booths provide multiple digital and sensory interfaces for remembering and venerating the dead. Each booth typically has a vase of flowers, a vessel of incense chips and an incense burner (Figures 1,2). Most booths also include a large digital monitor that displays photos of the deceased (both a formal portrait and snapshots) and personal information, including their posthumous Buddhist name and date of death. This digital monitor system is operated by a computer that offers limited storage space to the bereaved; in our observations at ACCs, each family was allocated the use of only 2 MB. When storing urn(s) in the ACC system, the bereaved family prepares a few digital photos and the ACC staff or the chief Buddhist priest upload the images onto the PC. As each family box can contain multiple sets of remains, some ACC allow visitors to 'swipe through' or watch a slide-show of multiple records and photographs on the display.



Figure 3. Selecting a visiting booth and calling up the family remains with an ID card, at the entrance of an ACC.

ACC emerged in the 1990s as an alternative to the traditional grave system in densely populated urban areas, where there is major competition for urban space, and gravesites often rank as a low priority [2]. Since the middle of 20th century, the vast majority of Japanese have been cremated (currently over 95%), and their ashes interred in multi-generational stone graves, located in cemeteries near the patrilineal hometown. But Japan has experienced what Mark Rowe labels a kind of "grave revolution" over the past thirty years [23]. New methods of treating cremains, including scattering ashes [3] and storing them in the home (temoto kuyo) have emerged to address the diminished availability of gravesites and the financial burdens that traditional lavish memorials place on the living. We found that ACC not only addresses these social needs; by combining the technologies of cremains storage with new digital means of memorialization, they have the potential to shape new forms of interactive rituals of remembrance.

Yet, little is known about people's perceptions of and interactions with ACC. To this end, our study aims to address the need for additional research that explores (i) how interactive systems shape practices related to the *postself*—how the identity of the deceased is socially contributed [17,1] and, more broadly, (ii) the need to better understand how interactive technology and spiritual practices are becoming entangled worldwide [4,27].

FIELD STUDY METHOD

Our field research was carried out in two stages. In the first stage, we visited seven ACCs located in/near Tokyo to observe and compare their architecture, the booth infrastructure, and their use of digital media. We aimed to visit as many ACCs as many as possible that had adopted the digital image display in their visiting booths. The basic features of ACC (conveyor-belt mechanical operating system, ID card based access, the booth design, images shown on the display) are almost all the same. In each hourlong observation, administrative staff guided us through how to use/experience ACC, using their own demonstration mode, since strict privacy policies prevented them from showing us real users' data. During our observations, we also interviewed staff members about their experiences with the ACC as well as the practical workings of the system.

In the stage two, we revisited two ACCs and visited one new site to interview the Buddhist chief priests who officially own these institutions. Our goal was to understand how the priests perceive technologies for memorialization, both the ACCs and digital technologies more generally. Each interview lasted roughly 90 minutes.

All data were collected during 2016-2017. We made audio recordings of all conversations with the ACC staff and Buddhist clergy, and took photos and video where permitted. The interviews were conducted and transcribed in Japanese; all translations are made by the first author.

FINDINGS

The ACC technology is a form of public infrastructure that represents a digitally-enabled reconfiguration of the geography of gravesites in contemporary Japan. Specifically, the ACC system is designed to make visiting the dead more convenient for those living in the city, who are unable to travel great distances to visit the family gravesite in their hometowns. All ACCs we observed were located in dense urban areas in close proximity to public transport. The automated conveyor belt storage technology combined with the digital ID card user management system makes possible the storage, organization, and visitation of thousands of sets of cremains in a single location. Over the course of our observations, it became clear that the interaction design of the ACC system closely resembles the metaphor of a computer operating system: 'data' (remains) of a departed loved one are called up onto an interface, which can be navigated through the modes of touch and sight as desired. In this way, ACCs leverage the placeless quality of digital data [21] to enable both multiple representations of the departed and real physical remains to coexist at a single site. Yet, perhaps like computers, most users seemed to have little understanding about how the underlying system actually operated beyond the screen. Next, we describe and reflect on these insights in further detail with an eye toward how ACC shaped material and social practices for honoring departed loved ones in Japan.

Technology-Enabled Columbarium and "Invisible" Urns The ACC technology offers increased efficiency and convenience for the storage and visitation of the dead. Yet, it also requires users to place their trust in a largely opaque mechanical-digital interactive system to ensure the safeguarding and sensitive treatment of their passed loved ones' remains. In Japan, the more traditional style family graves are managed by a local cooperative or temple, such that descendants often have a personal relationship with the people that care for their family grave, often over several generations [3]. The ACC operates through automated robotic machines with only a handful of stewards on site, meaning that visitors might have little or no contact with facility attendants during their visit. The essential function of the ACC is to provide an experience of physical copresence with the deceased, enabling descendants to perform ritual actions in remembrance or care. ACCs' emphasis on grounding its experience and interaction design around the cremains of loved ones evokes a strong focus on familial identity, which marks an important difference from traditional urban gravesites and communal memorials. The system requires visitors to rely on technology to initiate a temporary intimate moment of copresence with the departed's remains. Within the ACC, the human remains are highly mobile, moving through the system on conveyor belts and holding racks with no fixed location. Visitors can access their family's urn at any of the booths.

However, this backstage infrastructure is not visible to visitors and very rarely featured in promotional materials. When called up to a specific booth, the remains themselves are not directly visible to the visitor (they are placed behind a colored stone by the conveyor belt). It is only through referring to the digital monitor, that displays photographs and data about the deceased, that the identity of the remains can be verified by the visitor. Further, one's dependence on the invisible mechanical infrastructure is perhaps most keenly felt when the technology fails, and the ashes cannot be retrieved. A chief priest we interviewed noted that the system breakdown happens at least once every few months. In cases like this, visitors are turned away and cannot gain direct access to their deceased.

Less Physical Rites, More Focus on Digital Interaction

This depersonalization in the ACC technology extends in a more concrete sense to the booth interface itself. The ACC replaces typical Japanese memorialization artifacts (e.g., the family grave and domestic Buddhist altar) as a space where descendants can give thanks, seek counsel, and make offerings to the dead. These acts have occurred through a multi-sensory analog interface established by the Buddhist tradition, including reverberating brass bells and sutras (sound), smoky incense (scent), flowers and candles (sight), prayer beads (touch), and offerings of sweets and fruit (taste) [6]. Yet, as the booths at the ACC are only temporarily occupied by each user, visitors are discouraged from bringing their own offerings. Users thus cannot make personalized offerings of items such as their favorite sweets, alcohol, or tobacco to the deceased. Several ACCs in Tokyo suggest that visitors can bring offerings to place before the booth, but they must be taken home immediately after use. Indeed, fire safety laws in Japan prevent open flames to be used for the incense. In this way one might suggest that ACC technology, as a 'time-share grave,' transforms not only the geography but also the temporality of death. Rather than a permanently and singularly located grave, it introduces temporal and spatial contingency into an encounter between the living and the dead. Another of the key rituals in Japan-washing the grave stone with water to cleanse it of physical and spiritual impurities [11]--is also rendered impossible by the ACC interface.

Within this context of diminished physical rites to be performed at the grave, the digital display might take on new import. This is despite some ACC staff reporting that the screens came largely as an afterthought in the design process for the original ACC facilities. The digital display is often activated during the time it takes for the metal box to be transported to the booth, such that the screen itself becomes an initial (if not primary) site of interaction and ritual remembrance. Indeed, staff told to us that visitors to ACC sometimes appeared to oscillate between the digital display and the gravestone, and direct as much attention and silent prayers to the screen as they do the ashes.

Understanding the Mediating Qualities of ACC

Our field research highlighted numerous instances in which the digital-mechanical design of ACCs requires an extension of faith in the system and that certain aspects of contemporary ACC design can result in depersonalizing experiences. However, the ACC technology can also afford privacy, independence, and through these opportunities for new kinds of interaction with the dead. Establishing and maintaining a grave at a temple-run facility in Japan often involves significant and ongoing financial expenses, including a yearly tithe to be paid to the temple [23]. It also reinforces potentially onerous social ties between the family and the temple that are formalized in a kind of parishioner (danka) system, which in an increasingly secular Japan, many individuals now may wish to dissolve [3]. Although ACCs are also often authorized by religious (Buddhist) organizations, they usually exist as distinct facilities with little direct contact between visitors and clergy, and they typically accept people of all Buddhist sects and faiths, as well as those unaffiliated with any religions. The ID card system frees visitors from the need to interact with staff in order to access their family remains, which, in certain cases, can positively support highly personal experiences of memorialization within these semi-public settings.

ACCs are emerging facilities that make visiting graves more inclusive to a larger number of urban dwellers. Staff at an ACC reported that some visitors regularly stay for hours at the booth, looking through the displayed photographs and spending time in the presence of the deceased. This length of stay is highly uncommon for outdoor gravesites in Japan. Indeed, the phenomena was a cause for concern for several ACC-affiliated monastics that we interviewed, as it was perceived to potentially lead to unhealthy kinds of attachment to the deceased, that might stall the bereaved's grieving process.

DISCUSSION AND CONCLUSIONS

Researchers and designers investigating interactive memorialization systems have a critical responsibility to address the balance struck between physical and virtual presences, personal and public experiences, and their potential effects. Our study offers initial insights into the emergence of ACC technology in Japan, which promises to have significant impacts in this regard. We have described and reflected on how it introduces an emerging public infrastructure that structures new kinds of experiences of proximity or distance and presence or absence between the living and the dead. The ACC both stores the departed's physical remains and virtual/digital remains, but also, through its mechanized system of moving remains, ID cards and public booths, depersonalizes and largely anonymizes the gravesite. In doing so, the ACC requires the visitors to put their trust in a "face-less technology" in hopes of creating an intimate moment of connection with the dead, although only the digital remains are visually accessible in this encounter. Considering these consequences, designers have to carefully curate the realization of the deceased.

Tokyo is a densely populated area that faces unique limitations on memorialization spaces [2]. But it also serves as a bellwether, and designers and researchers will have to grapple with how to successfully combine access to bodily remains and virtual remains in the future-an area that has received little attention in HCI community to date. The limitations placed on traditional embodied ritual actions (e.g. washing the grave, offering perishable goods) that arise from a shared gravesite infrastructure represent both a challenge and an opportunity. Working within the limitations of time and space presented by the ACC, there is an opportunity for interactive systems to play a greater role in support meaningful, personalized experiences for the bereaved. This might include richer, multi-media, tangible/touchless interactions that mimic ritual actions [26,27], or visual actuation through which the dead could be momentarily made present and brought into the This would require a more thorough gravesite. consideration of digital infrastructure from the inception of ACC or similar infrastructures. It also means seriously engaging with and resolving the anxiety expressed by some Buddhist clergy in response to emerging technologies, such as virtual reality, and its potential to 'take over' other forms of memorial. As such, how designers adopt emerging digital representation technologies must be critically considered through an ethical and social lens.

Finally, the social meanings and individual experiences of ACC and other newer memorialization technologies will be revealed and reviewed over the next few decades to come; and, thus the longer-term implications of these systems must be taken into account in new design interventions [c.f., 8]. Our research has focused on the opinions of staff and Buddhist clergy, not the experiences of real ACC users. Collectively, this suggests the need for continuing on-site ethnographic fieldwork and long-term analysis as well as generative inquires in the HCI community to better critically consider the opportunities, benefits and potential consequences bound to the emergence of ACC memorialization technologies now and into the future.

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