



Figure 1: Its outlining shape is round-cornered, evoking an approachable and ergonomic design. Its L-shape makes the display easy to see, and buttons easy to access. Its portable dimension makes it easy to carry (L = 22cm, W = 11cm, H = 17cm). The main body is made of porcelain white acrylic, and part of it is covered with wood-grained paper, making it look slightly old-fashioned, which is in line with the aesthetic taste of older adults.

# Slots-Memento: Facilitating Intergenerational Memento Storytelling and Preservation for the Elderly

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## Abstract

Mementos carry personal symbolic meaning and can be used to privately reflect on the past or share memories[28]. Older adults spend much time collecting mementos but spend less time telling stories behind the mementos. Once they pass away, stories behind mementos vanish with their owners. In this paper, we present Slots-Memento, a tangible device aiming to facilitate intergenerational story sharing and preservation for older adults. It builds on the metaphor of slot-machine, and integrates functions of memento photo display, story recording, and preservation. Our design process started with context inquiry, older adults and young adults were recruited, aiming to understand the status quo of their memento storytelling, and define design requirements. A preliminary evaluation was conducted, discussion and future work are in the final part.

## Author Keywords

Older adults; memento; storytelling; tangible interface; social interaction.

**Basic information**

Age, gender, physical condition  
Familiarity with technology

**Communication with family**

Who, number, frequency, duration  
of contacting with family members  
Way of keeping in touch (face-to-  
face, phone, skype,.etc)

**Current story sharing situation**

Mementos (like photographs,  
artifacts, everyday objects, etc.)  
they kept and the reasons,  
Situations, and causes of sharing  
memento stories  
Who, when, how to share them  
(face-to-face, phone, skype,.etc)  
Topics, duration, and frequency of  
story sharing  
Problems encountering during  
memento story sharing

Table1: Interview questions in  
contextual inquiry

**Validity**

Would you like to use it?  
Do you think it could facilitate  
sharing memento stories? Why?

**Interaction**

Do you understand the concept of  
the prototype?  
Do you find it easy to use? What is  
the most difficult part?  
Which part do you like/dislike most  
of the prototype? Why?  
A. idea of sharing memento stories  
B. memento pictures in the  
prototype C. the handle D. others  
Who, when, how to share them  
(face-to-face, phone, skype,.etc)

**Comments for improvements**

Table 2: interview questions in  
preliminary evaluation

**CSS Concepts**

- Human-centered computing~Human computer interaction (HCI)
- Human-centered computing~Collaborative and social computing
- Social and professional topics~Seniors

**Introduction**

Mementos are objects kept as a reminder of people, places, and experiences. When the same object was mentioned by young and old, young people connected to it actively, older people contemplatively[22]. Older adults typically have a rich knowledge of family mementos, which are highly valued, and support different types of family stories and recollections[19]. As technology advances, mementos (especially photos) are increasingly becoming digital[28]. Digital devices with online applications (Flickr, Instagram, Facebook, etc.) bring out great convenience for us to share mementos even with people at a distance.

However, storytelling and recording of mementos are still problematic for older adults: First, most older adults are still so-called 'Kodak Generation' maintaining print photo albums and physical mementos [15]. Currently passing around stacks of paper photographs while sitting around a table seemingly is the only way for them to share mementos. However, most of them live separately with their children (live alone or in a nursing home), making their mementos are hard to share with their children and preserve. Second, most older adults are still disconnected from the mainstream online social circles due to the lack of using experience and devices that resonate with them[29]. Therefore, digital online applications and websites for sharing mementos are normally inaccessible for them.

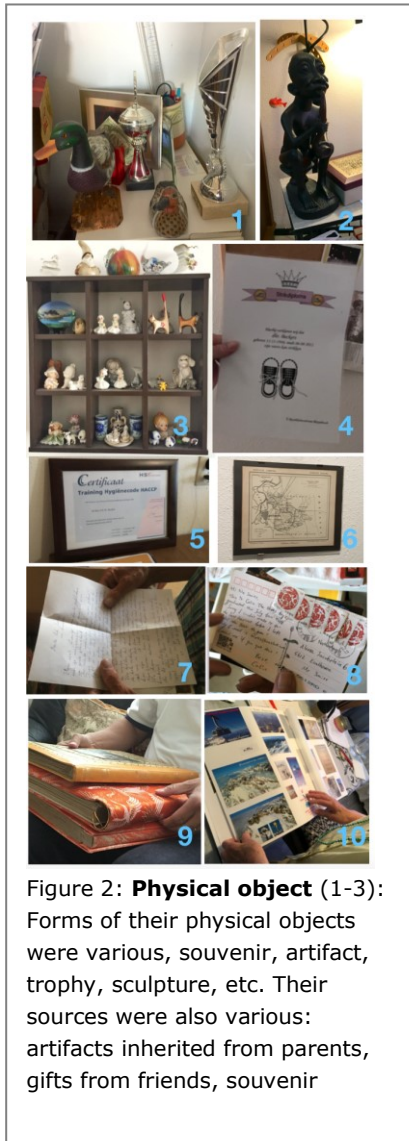
**Related Work***Ethnographic studies on physical mementos*

There are ethnographic studies describing how and why particular objects become mementos[20], and exploring why and how those objects are kept and archived within the home [14]. Some research focus on family photos: Chalfen et al. acknowledge the central role of film photography in family representation and draws attention to how familial and domestic conventions are reproduced [2]. Swan and Talor's study points out that photo displays play into the shaping of a moral character to the home [27]. Richard Banks et al 's study focuses on heirlooms, and they investigate the role technology play as part of the process of inheritance[1]. As mementos are increasingly becoming digital, some fieldwork looks at characterizing and comparing physical and digital mementos in the home [19], as well as their advantages and disadvantages[6].

*Applications for memento storytelling*

Current applications focus more on digital mementos, which could be generalized into the following:

- Capture personal mementos: In order to capture data about one's personal life and keep a record of the past, the research area called lifelogging aims to benefit from the advantages of digitally storing memory cues by aiming for 'total recall'[24]. The data captured are various, from pictures [23], sound[18][4], to videos[25]. The forms range from tangible devices to wearable devices [10].
- Organizing and archiving personal mementos: These kinds of design are based on people's vast quantity of digital contents. Related applications mostly



employ interactive devices, such as an interactive multi-touch tabletop [13], and a projector [9].

- Displaying and sharing personal mementos: People display photos in their homes to share narratives [12]. Most related works are used within nuclear families, aiming at facilitating conversations within family members. Most are in the forms of smart/interactive frames: “Photoswitch” [5], “Cherish System” [21], a system [7]. Their fundamental guideline is to enable digital content more accessible through devices that merge interactivity of physical objects with digital content.
- Others: other applications include attaching related stories to mementos based on barcodes and RFID technology: [26], [17], [11].

#### Knowledge Gap

Notwithstanding the above, questions remain. First, little research and design have been particularly paid to elderly users. HCI researchers give more attention to personal digital content, while mementos of older adults are mostly in physical format. Second, related applications mostly focus on co-present sharing, which are used within nuclear families, which are not applicable to older adults. Third, digital applications are designed for the young generation, which are not accessible for most elderly users. Fourth, for the research related physical memento, they focus on the mementos themselves, stories behind the mementos are normally ignored. While we focus on both the mementos and the representations behind them.

#### Context Inquiry

Our design process started with context inquiry, aiming to understand the status quo of their memento storytelling, and define design requirements. We

interviewed with older adults and young adults separately. As we aimed to deem the older adults as memento story producers, our context inquiry focused more on the older adults’ side.

7 Dutch elderly people (five female and two male) were recruited, they were ranged in age from 73 to 84 years. Their marital status was: two lived with spouse; five lived alone (four widowed and one divorced). None of them reported any significant physical impairments. Each study consisted of a guided tour and a semi-structured interview. The study was held in the participants’ homes, which could allow them to recall and describe their routines for photograph and memorabilia storage and sharing in context. We first asked them to arrange a brief guided tour of their homes, aiming to examine their mementos for displaying and stored in hidden places. With their permissions, we took photographs and notes. We then conducted semi-structured interviews (Table 1), which were audio recorded with their formal consents, and notes were taken to aid analysis. We also conducted short semi-structured interviews with five young adults (three female and two male). They were employees of the local university, ranging in age from 38 to 43 years. They all lived separately with their parents and grandparents. They all married and lived with partner and children. The interviews were based loosely on “Current story sharing situation” of Table 1.

Grounded theory techniques [3] were adopted to analyze the above data, and affinity diagramming [8] was used to categorize these codes.

from travelling, and even made by themselves. **Paper document** (4-8): Their paper documents included postcard, letter, certificate, map, etc. **Photo** (9-10): Their photos were mostly in physical format, and all the participants kept several albums. Compared with artifacts, photos were more space-saving, therefore, photos were the most mementos that older adults held. Apart from one participant left his photos unsorted, the other six participants carefully organized their photos in the albums, envelopes, and boxes.



Figure 3: Mementos in hidden places

## Findings

### *Basic information and their familiarity with technology*

Apart from the youngest elderly participant (M, age=73) had an iPad and used it to browse news, watch videos, and play simple games, the rest didn't use computers or smartphones. Either because they lack using experiences, or physical decline brought inconvenience (eyesight declines, movements and reflexes typically turned slow). They acquired information still mainly by traditional tools: newspapers, magazines, TV, etc.

### *Connection with family members*

Connections with their siblings were less, because they were also aged, or even passed away. They had regular contact with children, who visited them regularly (ranged from once a week to once a month), and duration of each visiting was 2-4 hours. They typically connected by telephone. They called their children only when in special and urgent situations (festivals, diseases, etc.). Although some of them lived collective lives in the nursing home, they found it difficult to establish meaningful relationships with fellow residents.

### *Types of older adults' mementos*

In David Kirk et al.'s study, they divided family mementos into physical, digital, and hybrid [14]. In our study, older adults' mementos were mostly in physical format. Therefore, physical mementos need to be further sub-classified. Because of the great number of photos that the older adults kept, photos were classified as one category. Ultimately, we classified their mementos into three categories (Figure 2):

- **Physical object.** As most older adults moved home multiple times, some artifacts were discarded, or

given to their children. Only a part that was lightweight or precious were still in their possession. Especially for those who lived in nursing homes, the rooms were too small to hold all their belongings.

- **Paper document.** The certificates and maps were mostly displayed. Postcards and letters were tucked away in storage, either because they were hard to display, or they were too private.
- **Photo.** The albums were normally of different themes, for example, family, travelling, marriage, etc., and photos inside the albums were generally arranged in chronological order.

### *Location of mementos*

Consistent with previous research [19], we found apart from a fraction of mementos were placed on display, most mementos were stored in hidden places (Figure 3).

- **Mementos for displaying:** Although decoration styles varied in older adults' home, they all had a small part of mementos displayed. For example, photos hanging on the wall, artefacts on shelf and table, etc. The reasons were either because they associated with special meaning (family photos, gift, inscription, etc.), or because of their artistic values.
- **Mementos stored in hidden places:** As mementos took up too much space, most were placed in hidden places, such as drawer, closet, cabinets, even attic, basement, etc. This made the older adults seldom revisit them, not to mention telling stories behind them. The older adults gradually forgotten them.

### *Situations of memento storytelling*

First, although mementos for displaying evoked conversations with guests, this happened only when family members or friends came for visits, which was accidental. Second, one older participant said



Figure 4: It contains two display interfaces: The **Photo interface and Recoding interface**. Vintage style is also applied in both the interface elements and fonts. There are usage tips at the bottom: "Note: Press "REC/STOP button before/after recording".

The **Photo Interface** displays one specific memento photo, which will be switched to the next/previous photo by pulling down/pushing up the handle. It will be switched to **Recoding Interface** if the REC/STOP button is pressed, and a dynamic recording icon and timer widget are placed to provide real-time feedback.

sometimes in holidays, the whole family would sit together to look through albums together, but that also happened occasionally.

#### *Problems encountering when sharing memento stories*

- Memento for displaying didn't fully support personal reminiscence: The older adults stated that those mementos in home environment were so familiar that often they didn't realize their presence.
- Mementos storytelling were seemingly ignored by both older adults and their children: Despite that all young participants stated that they were in stories behind their parents/grandparents' mementos, they rarely talked about the mementos specifically and deliberately in daily lives. They realized its importance only when their parents/grandparents passed away.
- Distance also prevented the intergenerational memento story sharing: Visiting time was short, they didn't have too much time to specifically talk about.
- Others: Older adults had the desire and demand of preserving lives: They hoped their lives could be remembered. For example, one participant filmed a video to document his life. One made a brief biographical note, in case their children wanted to know him when he passes away. Another participant had scanned and saved some of his photos.

#### **Design Requirements**

- Integrating mementos into older adults' daily environments: As physical mementos took too much space, most of them were stored in hidden places, making them not accessible for sharing. We consider integrating them into their daily lives through an

interactive device. Hence, a digitalization process of physical mementos is needed, which also contributes to memento preservation.

- Cross-generational cooperation: Although older adults had rich knowledge of family mementos, they normally were not skilled at technology. Whilst the young are empowered by technical competence. Therefore, our scheme is cross-generational cooperation: the young are responsible for digitalization their family mementos, while older adults are the memento story producers.
- Tangible interface employing metaphor and intuitive interaction: As most elderly interviewees couldn't operate digital devices, a tangible interface could be adopted. Physicality also makes it better integrated into their living environments. We could also employ metaphor and intuitive operation to enhance familiarity and simplicity for them.
- Using audio as the storage medium of stories: Given that older adults felt difficulty in writing as they age, compared with handwriting, direct speaking could lower the cost of narrative for them. Moreover, audio could retain more information than the text. (emotions, feelings, ambient sounds, etc.) In our context, audio also shows advantages over video: A study points out that video is too real to allow room for thinking about the past with others [2].
- Could be used either face-to-face or separately by older adults and their children: Despite that sitting together to communicate face-to-face is the most common and enjoyable way to share mementos[16], most older adults lived apart from their children, and duration of each visiting was limited. The older adults and their children's lives were also usually





Figure 5: prototype's hardware

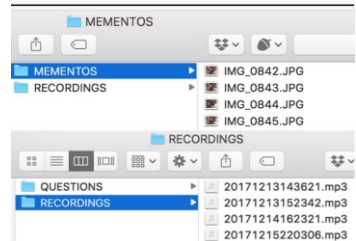


Figure 6: Flash drive is embedded in an MDF-made shell. There are two folders in it: **MEMENTOS**, containing the photos of mementos. **RECORDINGS**, containing story audios told by older adults.

unsynchronized. Hence, the prototype should be able to be used both face-to-face and separately.

### Prototype: Slots-Memento

Based on the above, we design Slots-Memento, which could either be used face-to-face or independently by the older adults and their children. Its interaction and form draw inspiration from slots-machine. The older adult could pull down/up the handle to switch memento photos, and press the button to record stories. We hope the metaphor of slot-machine and intuitive operation could offer familiar and enjoyable using experience to this non-tech-savvy user group. It consists of a slot machine-like device (Figure 1) and a flash disk (Figure 6). The flash disk is used to store memento photos and story audios. Interfaces are shown in Figure 4, and operation procedures are shown in Figure 7. Its hardware is shown in Figure 5: Raspberry Pi 2 Model B is the hardware platform, and the lever is 3D printed which could fit into the joystick component. Joystick USB Encoder board is the medium to connect Raspberry Pi and joystick. The 7-inch display is the graphical output.

### Preliminary Evaluation

To understand the prototype's acceptability to the older users, and get comments for improvements, we investigated our prototype with three older adults (81M,82F,79M). It was conducted in their rooms in nursing home (Figure 8). We firstly introduced purpose of our study, and showed them the prototype. We then asked what mementos older adults would like to share, and we took photos of their mementos, and copied them to the flash disk. Then, we asked them to use it, including browse memento photos and recording memories. Lastly, we conducted semi-structured

interviews with them, the questions were loosely based on Table 2.

Overall, the participants felt that Slots-Memento could facilitate older adults' memento storytelling, and was accepted by them. They showed interests in it, especially its intuitive operation. They enjoyed telling memories related to their mementos. Our work also helped them to revisit and rediscover their mementos. Some of which were they almost forgot: *"It is good to see these photos again. I almost forgot them. I think the device is great, and I can put all my stories and emotions into it."* The participants were excited when some mementos were rediscovered. The recording function was also accepted by them. One participant remarked: *"I wanted to write a book of my stories, but always don't feel motivated to that. My eyesight declines. The recording is helpful."*

Regarding comment for improvement, first, one participant thought the prototype should be more friendly by displaying *"Thanks for your story"* after their stories are recorded. Second, by default, it should display the photos as a slideshow, to attract their attention, and encourage them to use. Third, adding story playing function, they hoped to show and play the stories to others. Regarding usability aspects, the display's brightness needed to be improved.

### Conclusion and Future Work

We have presented our ongoing work Slots-Memento, which was designed based on contextual inquiry. It was accepted by older adults in preliminary evolution. Next, the prototype will firstly be optimized based on the feedback. Afterwards, a formal long-term study (2 weeks) will be conducted, driven by research questions:

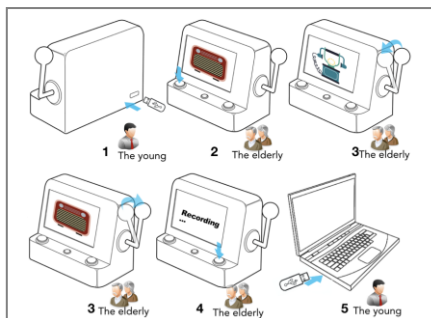


Figure 7: Detailed interaction process: (1) The young insert flash disk with memento photos into Slots-Memento, and then give it to older adults. (2) Older adults press the left button to turn it on. (3) Older adults pull down/push up the lever to switch to the next/previous photo. (4) Older adults press the right button to start recording, and press it again to save the recording. Stories told by older adults now are in the flash disk. (5) The young Plugs the flash disk into a computer to listen and keep stories, and further modifies memento photos (6) The Slots-Memento could also be used face-to-face.

*What mementos would older adults like to share, and what are the stories behind them? How to facilitate older adults to tell and preserve these stories? How to involve the young generation?* The prototype will be distributed to older adults and their children, mementos will be categorized, stories will be analyzed, and interviews will be conducted with both the older adults and their children.

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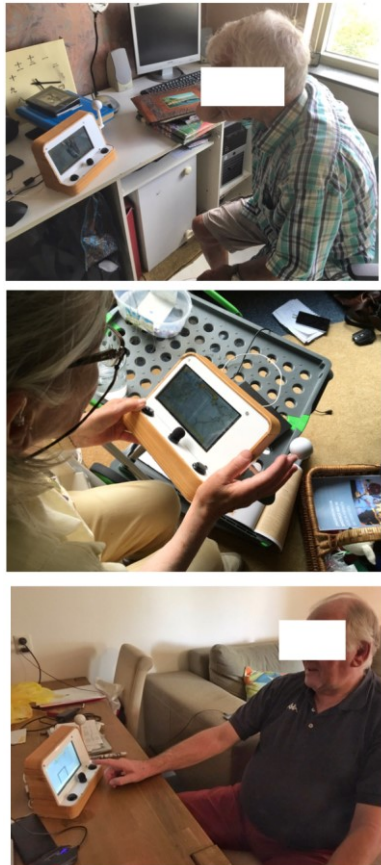


Figure 8: Interview with older adults

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