The Photostroller

Supporting Diverse Care Home Residents in Engaging with the World

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ABSTRACT
The Photostroller is a device designed for use by residents of a care home for older people. It shows a continuous slideshow of photographs retrieved from the Flickr™ image website using a set of six predefined categories modified by a tuneable degree of 'semantic drift'. In this paper, we describe the design process that led to the Photostroller, and summarise observations made during a deployment in the care home that has lasted over two months at the time of writing. We suggest that the Photostroller balances constraint with openness, and control with drift, to provide an effective resource for the ludic engagement of a diverse group of older people with each other and the world outside their home.

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ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design

INTRODUCTION
The Photostroller is a waist-high, portable unit whose most noticeable features are a large screen, a removable control unit (the 'tuner'), and rounded handles and wheeled legs (Figure 1). In operation, the screen shows a continuous succession of photographic images that fade from one to the next every 6 seconds in a never-ending 'slide-show'. The images are drawn from the Flickr™ website (www.flickr.com), accessed via a limited set of keywords using the dial on the tuner to select image categories, and refined by a slider on the tuner which shapes the search space (and which can also be set to hold the current image). A smaller display, set under the main screen, indicates the current search category and the title of the current image, and also gives feedback when the tuner has been adjusted.

We built the Photostroller for use by the residents of a care home in the north of England, as part a practice-based research project on technologies for older people. As with all the devices we build as an outcome of our research through design process, the Photostroller raises, and embodies positions on, a number of issues ranging from the detailed aesthetics of computational devices to ethical issues around aging. In this paper, we focus on four major themes that underlie the logic of its design. We argue that design can support older people's *ludic experiences* such as pleasure, engagement and sociability (c.f. [1, 2, 12, 14]), not just their needs for physical care. The *diversity* of 'older people', however, makes catering for these experiences a nontrivial task. We suggest that this diversity can be addressed by balancing *constraint with openness*, focusing the resources offered by a design enough to give it a clear identity, while offering requisite flexibility for those

Figure 1: The Photostroller

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resources to be used and appreciated in many different ways. In addition, by balancing *control* with *drift*, systems can be simple enough that older people will interact with them [2] while still providing access to a rich body of material.

These themes and the logic that connects them became clear over the course of our research, and ultimately came to be expressed by the Photostroller itself. In the following sections, we allow the themes to emerge as we describe the process that led to our design. We start by introducing the site with which we worked, describe the observations and interventions we made there, the design process and eventual implementation of the Photostroller, and finally our observations of how the older people have been using the device. Finally, we return to these themes, and related research, in our concluding discussion.

JACOB HOUSE

Jacob House is a state funded residential care home in a city in the north of England. It caters for both permanent residents who have their own rooms and also day visitors who come two or three times a week for care and company. There were twenty-eight residents when the study began, the majority of whom are in their eighties and nineties. The oldest resident was one hundred and four years old; three of them will shortly turn one hundred. The majority of residents have high levels of dependency requiring assistance in most activities of daily living. Some of the residents also exhibit early signs of the onset of dementia.

Residents are assigned private bedrooms each having space for a small amount of furniture (e.g. an armchair, table and chairs, dresser and television). Many tend to spend their days in one of the two main sitting rooms on the ground floor. The largest (the 'main lounge') is a dining room with a shuttered counter at one end of it leading to the kitchen; dining tables and chairs are arranged around one side of the room, there are armchairs on the other side facing a large flat screen TV attached to the wall. French doors lead to an outdoor patio and garden where the older people can sit in clement weather. The second sitting room is sign-posted as the 'Quiet Room'. Armchairs are set here in an oval shape around the room, there is a large window looking out at the city walls at one end, and a fireplace along one side.

The daily routine in Jacob House is quite fixed although the residents are not obliged to follow it. Residents are served breakfast, lunch and dinner in dining rooms at fixed times; tea and coffee are served regularly throughout the day. Many residents cannot get to the dining rooms without assistance so a major part of the work of the care staff is moving them into wheelchairs using hoists. This activity punctuates the times between meals when residents have to be taken to the toilet. There is usually an afternoon activity led by a carer such as karaoke, dancing or a quiz. A hairdresser and manicurist visit once a week. Most of the residents go to bed at around eight pm although there is no compulsion to do so. Night staff check on each resident throughout the night to ensure that they have not fallen.

Observing and Intervening

Our initial view into Jacob's House took the form of regular ethnographic observations and interviews over the first months of the project. There were a number of methodological challenges in working with the older people at Jacob House. Residents found interviews demanding, quickly became tired and sometimes distressed. Moreover, although the director of the care home understood our basic intentions and welcomed us into the site, some of the staff were wary of us perhaps because of the frequency of official inspections on the one hand, and journalistic exposés in the national press of poorly-run care homes on the other.

To facilitate our engagement with Jacob House, we opened out our ethnographic stance to include various interventions and facilitated activities. These helped the residents and staff to become more familiar and comfortable with our presence as well as being of research value in themselves. The interventions served as 'tickets to talk' [15] (and importantly, on occasion, 'tickets to be silent' [3]). For instance, early in the project, we installed a Video Window, a large monitor inside the main lounge showing the view from a camera mounted on the roof of the building. This spurred a number of conversations with residents and carers. In addition, a local member of the team introduced the residents to a variety of electronic music devices, GoogleEarth and iPhone apps in a series of informal sessions that prompted a great deal of personal conversation from the older people, as well as giving some indication of their orientations to technology (for more detail, see [3]). These included a series of sessions using a data projector to display Flickr slideshows on a blank canvas hanging on the wall, using topics and search terms generated in conversations with the residents. The sessions gave rise to a rich mixture of anecdote, reminiscence and discussion, and were one of the inspirations for our eventual design.

Impressions

As the project progressed, the design team joined in several of the visits, making their own observations which supplemented, and were informed by, reports of the previous observations and interventions. In this section, we describe the overall account of Jacob's House the team developed from these various encounters, an account that served in the transition from observational study to design.

First, we were struck by how passive and sedentary the lives of the older people appeared. Most of the older people were to be found in the main lounge, sitting in one of the numerous armchairs arranged into clusters in the room, chatting, watching television or dozing off. With the institution taking care of responsibilities such as cooking, cleaning, entertainment and even movement for many of them, most of the residents appeared to submit to the rhythms and activities suggested by the carers, even though they were free not to do so. To a degree, this passivity seemed related to physical and sensory constraints. With

locomotion difficult for many, as well as deteriorating eyesight, hearing, and manual dexterity, the zone of activity for many of the older people was centred closely around their person, and particularly in the areas around their laps or nearby tables.

Despite the somnolent appearance of the lounge, however, it became clear that the older people comprised an evolving and complex social community. Residents had friends and enemies, formed cliques, pursued romances and suffered jealousies. Some spent most of their time in their own rooms, preferring to avoid those who clustered in the lounges. One group of relatively active residents and day visitors started to habitually frequent the new lounge soon after its conversion from a dining room, preferring the Quiet Room to avoid the television in the main lounge.

One of the sources of the complex sociability we witnessed appeared to be the considerable diversity amongst the residents. Their differences occurred along many dimensions, including their personal histories and previous employments, current interests and orientations, preferences for sociability or solitude, attitudes towards the care home, and their immediate cognitive and physical abilities. Few topics or activities could capture the sustained attention of a majority of residents. Social alliances appeared provisional, based on overlapping preferences (say, a shared interest in birds) becoming temporarily important, but vulnerable when differences were salient. Thus some inhabitants were involved in relatively stable social groups; others were more isolated.

Thus if a complex social order underlay the residents' apparent passivity, it was nonetheless difficult to escape the impression that many of the residents were often bored and lonely. They greeted visitors with interest, if sometimes with suspicion, and occasionally complained if more attention was paid to some of them than others. They welcomed interventions that allowed them to look beyond their immediate environment – explorations of GoogleEarth or archive photography, as well as the Video Window – but seemed to value the human engagement of the researchers, artists and students as much or more than the specific activities and experiences they offered.

In addition, residents sometimes appeared deeply unhappy with their current circumstances and in dread of impending death. Early in the project we had a poignant conversation with a man who told us, tearfully, that he had travelled all over the world, from Asia to South America, but never imagined he would "end in a place like this". Several of the residents died during the course of the project, and when this happened it was traumatic for those that survived not just because they had lost a friend but also because it reminded them so forcefully of their own mortality. One resident was so terrified of death that when anyone died she would retreat to her room for two or three days.

Life at Jacob House was not as gloomy as these more distressing observations might imply, however. If the residents often appeared inactive, most also seemed cheerful. If there was occasional evidence of enmity, intolerance or envy, there were also ample signs of warmth, caring and generosity. Finally, if the older people sometimes appeared to crave more active and social engagement, this was through no fault of the staff at Jacob House, who continually demonstrated extraordinary professional dedication and personal commitment despite limited resources.

INITIAL DESIGN DIRECTIONS

Our involvement with Jacob House extended for almost two years before we started concerted work on the Photostroller. From very early on, however, we started to consider what we might design for Jacob House, exploring ideas through a variety of sketches, proposals and conversations as we learned more about the site from our observations and interventions.

For instance, an early concern was with the role of television in the care home. We were struck by the fact that the television in the main lounge was always on although it often seemed that nobody was watching it. The importance of television in care home literature is well documented [10]. It serves a number of useful social roles – it is a focal point, an excuse to gather, sometimes a ticket to talk [15]. Nonetheless, it was often ignored or irritating. This led us to experiment with systems that might have the visual intrigue of television but without the noise and narrative that can be irrelevant or distracting. We ultimately abandoned these explorations, but the Photostroller can be seen as their unintentional culmination.

Another set of concerns emerged around the notion of 'sensorimotor toys'. These built on our observation that the focus of attention and activity for many of the older people was around their laps, and also on having witnessed one of our own aging relatives repeatedly play with mechanical toys such as a Newton's Cradle. There seems to be a fascination and satisfaction in being able to engage with simple devices that exhibit the balance between predictability and chaos. Existing therapeutic tools such as the Snoezelen [5] seem to reflect this view.

Our interest in sensorimotor toys became linked with a third set of concerns, including the possibility of supporting people engaging with the end-of-life experience. It was clear from our observations that this was a paramount issue for the Jacob House residents, but despite our initial excitement about the topic we were unable to convert this to convincing design ideas.

Difficulties and an 'Experiment'

After more than a year exploring design ideas, we were still unsure whether any of them would lead to devices that a significant number of the older people would find meaningful. Our experience was that they engaged enthusiastically with activities and devices as long as these led to contact with new people but would quickly become uninterested if left to pursue them on their own. We wanted

to produce a design that would not rely excessively on social scaffolding, however. Systems requiring external involvement would be difficult to sustain, given how busy the care workers at Jacob House are already. From this point of view, the system should be open to uses in which social scaffolding is a possibility, but not required.

In order to assess whether any of our lines of thinking might lead to success, we built a set of small-scale design experiments for the residents of Jacob House to try. We gathered about a dozen items for an afternoon 'show and tell' session at the care home. These included a number of purpose built devices, such as an electronically controlled laser 'spirograph', a handheld video viewer (Figure 2), and several books of thematically organised photographic prints, as well as a number of commercially available systems including the Tenori-On [13], various iPhone apps, and a set of manipulable children's toys.

Over the course of an afternoon, six of us circulated informally in the lounge, showing the things we had brought to residents, usually in small group sessions. This was an enjoyable event, and we later received very positive feedback from the care staff. Moreover, we learned a great deal about the residents in the process. However, the devices did not fare so well. Apart from their occasional suspicious reception *(Take it away! We don't want to buy it!*), the residents greeted most of the devices with polite momentary enthusiasm *(Did you make that? How clever!*) only to discard them after a few moments. Of all the things we brought, only the video and photographs seemed to sustain interest, and at the end of the day we had to admit many of our design directions did not appear promising.

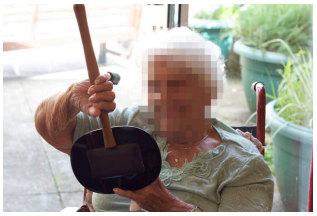

Figure 2: Using the handheld video player

After a break for reflection, the team regrouped to discuss what we had learned and how to proceed. Our interpretation of the ways the older people did and did not engage with the things we had brought them served to emphasise the older people's diversity. Insofar as they engaged with the items we brought, individuals and subgroups showed interest in different material. These observations might have encouraged us to design specialised devices around the interests of subgroups, but with the exception of the images and video even the relatively intense engagements were short-lived. Two men played who with the Tenori-On put it down after about fifteen minutes and did not engage with it again. Residents interacted with the sensorimotor toys for a few minutes, then set them aside. In general, we reached an overwhelming impression that the older people were simply not interested for long in self-contained playthings, but were keen for resources that allowed them to engage with the wider social and physical world beyond the care home. In particular, photographs – whether of historical images, or children and families, or of outer space – all sustained relatively long-lived interest, occasioning discussions ranging from anecdotes about personal or cultural history to more spiritually loaded remarks (one man started to laugh upon seeing an image of a spiral galaxy: *we're so small!*). It became clear to us that, in order to have any hope of sustained engagement from the older people, we would have to provide them resources to look beyond their immediate circumstances.

The 'show and tell' session at Jacob House was a turning point for our design work, prompting us to focus on giving the residents greater access to the world beyond the care home (cf [8]). Subsequent proposals ranged from ideas for creating electronic 'monoculars' which the older people could peer into to see video feeds from remote bird boxes, to devices that would allow the residents to specify 'sound journeys' sweeping through ambient sounds recorded in different parts of the world. Many of our ideas revolved around devices that would display slide shows drawn from Flickr. These were inspired to a great degree by the success of the sessions facilitated by our local team member. The enthusiasm these engendered was reinforced by the residents' positive reception to the photograph booklets we brought to the 'show and tell' session. Thus our speculations increasingly centred around the idea that a continuous slideshow device whose content could be steered by the residents might have lasting appeal.

THE PHOTOSTROLLER

Our initial conception of the Photostroller was that of a distributed system; a central mobile unit (the 'hub') containing the interface, processing and portable power which would wirelessly connect to various peripheral displays. We imagined that a combination of large projector displays and smaller hand-held displays would allow the device to be used in large groups such as in the lounge or dining rooms or more intimate sessions, i.e. in the residents' bedrooms. The basic idea of the interface was that the hub would contain a RFID reader whose input drives the content of photographic slideshow sourced from Flickr. Around twenty RFID tagged ornaments would visually represent the keywords they contained. These objects could be used singularly or gathered to build up more complex searches, yet the system would continue a 'chain of consciousness' browsing during periods of inactivity, slowly diverging from the original topic in a form of 'semantic drift'. This combination of control plus drift was appealing in allowing a relatively small set of initial terms to give access to a larger, and potentially serendipitous, range of images. We also imagined a keyboard interface for carers to drive the slideshow.

Refining The Design Brief

Our design development involved the co-definition of the device's physical form, interface and the basic algorithms that would control the search. We abandoned our original idea of using RFID tags embedded in ornaments, and later

ideas such as mounting tokens on wire tracks like an abacus, both because these centred control too closely on the device itself and because it seemed difficult to reflect the dimension of semantic drift that was integral to the device. We began working on a different type of interaction altogether. Whereas our initial ideas centred on selecting and combining about twenty search terms, our new scheme involved directly specifying the degree of semantic drift around a smaller number of basic categories. This method reminded the team of tuning a radio, which inspired the idea of a handheld tuner in which a dial would be used to choose from a set of pre-defined themes (e.g. 'local'), and a slider would be used to choose the degree of drift in relation to that theme (e.g. 'city', 'region', 'nation' etc.).

The decision to move to a smaller handheld interface enabled the team to explore different kinds of displays. In considering likely usage scenarios we concluded that deploying multiple, unwired screens could prove complex and unreliable both socially and technically. Instead, we decided to make a mobile display unit that could be self-contained, housing both the display and its associated computation and power. The size of this display would be suitable for use by small groups and individuals; a scale of engagement that our observations suggested was prevalent in the home. This scheme provided a basic structure for developing the software and hardware for the Photostroller, as we describe in the next sections.

Software

The Photostroller software accepts input from the tuner, uses this to specify search terms, interfaces with the Flickr API to make searches and handle returns, and controls the display of results. A cache of several thousand images is maintained on the Photostroller to ensure that the slideshow runs smoothly. Much of this is relatively straightforward, so in this discussion we focus on the most challenging aspect of the design: the implementation of semantic drift.

Implementing Semantic Drift

In seeking to operationalise the notion of semantic drift, we began by exploring algorithms that could automatically generate new search terms from old ones. Our attempts in this direction were many and varied. For example, in one method, given a search term, we retrieved a pool of images and computed the most common tags Flickr users had given to those images, composing a search term from them for the next iteration. Naturally, over iterations this would diverge from the original term. However, we found that user generated tags are often idiosyncratic and search terms would quickly become opaque or get trapped into retrieving a small number of specific images again and again. We tried using databases of word associations (such as WordNet, wordnet.princeton.edu) as a source for search terms. Again, it was difficult to implement a controllable form of semantic drift as word-associations diverge rapidly (e.g. *nature – spirit – brandy*). We also experimented with the tag clusters which Flickr itself provides. However, iterating over this would often draw us back to the most common tags on Flickr (such as 'flower') or those which are most commonly used in conjunction with others (such as the brands of cameras) with the result that sequences initiated with very different search terms would nonetheless display similar sets of images after a relatively short time.

After many such attempts, we decided finally to specify search terms manually. In the final design, we use six basic categories (local, history, family, travel, space and nature) and four levels of drift, requiring twenty-four separate groups of search terms. For each group, we specify four or five searches, each involving tags specifying what we want (e.g. 'Yorkshire') and additional ones to filter undesirable results (e.g. '-pudding -terrier'). Many of the search terms contain as many as ten or twelve tags, in an attempt to negotiate the surprising, but sensible, juxtapositions of tags used by contributors to describe their images in Flickr. Nonetheless, unexpected images still appear regularly, and one of the questions we had was whether the Jacob House residents would experience these as the result of a breakdown in the system, or as interesting diversions.

Hardware

The basic hardware components of the Photostroller are a modified 17" MacBook Pro and its power transformer, as well as an XBee 1 MW module that receives control signals from an identical unit in the handheld tuner and communicates with the laptop via the USB port. Using a laptop significantly eased the implementation of the Photostroller, allowing slideshow images to be received wirelessly, locally cached and displayed according to the settings of the tuner. In addition its built-in battery allows the Photostroller to be used untethered for significant periods of time, greatly enhancing the device's portability. The disadvantage was that we had to arrange the laptop so its screen could face outwards from inside the unit's housing. To do this, we detached the hinges of the laptop and folded it backwards – a delicate operation that essentially allowed it to be 'closed' in the opposite direction than originally designed. A large green 'on' button is mounted on the side of the case and mechanically connected to the laptop power button, a similar red 'off' button in connected to a modified USB numeric keypad replicating the 'DEL' key that, when pressed, causes the Photostroller software to implement a soft shutdown. The tuner is comprised of a rotary dial and slider both connected to an Arduino Pro Mini, which is in turn connected to an XBee 1 MW module that encodes their settings as a pair of numbers to be sent to the main unit. The tuner also houses a single AA battery.

This main unit's components are mounted within a CNC-machined plywood case, which is enclosed by a powder-coated, folded sheet steel cover. The body is supported by a tubular steel frame that also forms both the legs and the curved handles. The metal cover is cut to reveal two separate areas of the laptop screen, used to clearly distinguish the image display from the smaller display that shows information about that image (including the status of

the tuner, the tags used to retrieve it, its title, and, when appropriate, indications that these are being updated). The power cord emerges from the bottom of the unit, and a bracket and non-functioning socket mounted on the side allow the cord to be stowed when using battery power.

The tuner houses a rotary dial and slider, along with associated electronics and batteries, in a unit that we designed to be easy for the older people to hold and manipulate. The tuner's case was printed in three parts on an Objet Eden photopolymer 3D printer and later finished and professionally spray-painted.

Aesthetic tuning

Designing for a residential care home presents a unique situation in that there is a tension between the institutional and the domestic. Within Jacob House, efforts have been made to create a sense of domesticity both through the use of prop-like ornaments in an overtly domestic décor, and by the staff encouraging residents to personalise their rooms with belongings and photographs. Nonetheless, there is an inevitable institutional presence in the layout of the building, its furniture and fittings, and its routines.

The basic configuration of the Photostroller's housing needed to be simple, safe, robust, easy to move and straightforward to produce. To meet these requirements, we selected manufacturing processes that are commonly used for objects in such environments. However, initial design sketches tended to be too industrial in appearance, resembling medical or electronics equipment in a way we thought would discourage the residents from feeling allowed to touch or use the device. Thus a great deal of work went into refining the details of the design to make it seem less institutional and to encourage the residents to feel some ownership of it. Working with the early sketches, we began developing the form of the tubular steel frame, removing standard radii and uniform angles that reflected any mass-produced aesthetic, instead introducing more complex angles and shapes that give the Photostroller a particular stance, as if offering up the screen to the viewer, while softening the appearance. The final frame with its non-standard bends proved a huge challenge for the tube fabricators who had over 30 years of varied experience.

The handheld tuner proved to be an even greater challenge. We set ourselves the design brief that it should be able be used remotely or attached to the main body, simple to understand, easy to operate by users with limited physical ability and robust enough to withstand a fall. The main features of the tuner are a large rotary dial to select the slideshow category and a slider to control the slideshow drift. This basic two-part interaction was decided early in the process, but by prototyping these controls with cardboard models we realised we could add a third element of control by an arrangement in which the slider mechanically locks the dial when pushed to the highest position, so that the point where the two meet serves as a hold function. In the final configuration the overall shape, reminiscent of a paddle, is arranged so that the dial is embedded in a bowl-like head and the slider is mounted in the handle. Much work in refining the design of the tuner involved iterative prototyping of components on a Z-Corp powder printer in order to fulfil the ergonomic requirements of the brief, including around 40 versions of the dials and sliders, and over 20 casings.

Deciding upon a colour palette to use for the Photostroller was a particularly lengthy process, indicating how important we felt it to be. Through rendering 3D CAD models, we explored hundreds of colour treatments for the Photostroller to find an appropriate 'tone' for the device, discarding some palettes as too 'cold', others as too bright or childish. In addition we considered the effect of different colours against the LCD screen so that they would not distract from the slideshow imagery. In our final design, the main unit's case and the tuner body are both coloured 'oyster white', a creamy colour that is both subtle and warm, whilst the tubular framework is powder-coated 'mushroom' grey to contrast with the case. Inspired in part by the design of a classic *Bernina Nova 900* sewing machine, we highlighted the tuner's controls in a pure red to indicate the interactive elements.

Deployment

At the time of writing, the Photostroller has been deployed at Jacob House for more than two months. Most of the team were present at the hand-over to help with technical aspects of the deployment, to document the process photographically, and to introduce the device to residents in informal chats. By the end of the afternoon, we were hopeful of its success, as we had witnessed several residents beginning to engage with it, even introducing it to others and explaining its operation.

After the deployment, the local partner made weekly visits to Jacobs House to gather ethnographic observations and discuss the device with the residents and carers. This often involved sitting with the older people and chatting about the Photostroller as they viewed the pictures it showed. Another ethnographer on the team joined him on several occasions. What follows is an overview of their observations.

THE PHOTOSTROLLER IN JACOB HOUSE

The Photostroller has been used by a number of different people in different locations in Jacob House. A number of recognizable ways of engaging with the Photostroller have emerged depending on where it is encountered and within what kind of ongoing activity it finds a place. In this section we give a sketch of the various ways the Photostroller has been engaged with and the kinds of interactions it embeds within or brings about. Along the way, we will also discuss a number of other issues of importance with respect to our design intentions such as the effectiveness of the tuner and the drifting metaphor.

In The Quiet Room, At Large

Typically the Photostroller is to be found in what is known as 'the Quiet Room'. While the absence of a television makes the room 'quiet', the atmosphere in the Quiet Room is often lively, occasionally boisterous, and filled with conversation. It is where 'day residents' are often found. These are folk who, for example, visit Jacob House to give their carers or partners some respite, or who are making the transition into becoming full time residents. The Quiet Room is often where visiting friends or family may spend time with residents. It is a place where new relationships may be explored as it is the most likely meeting place between existing residents and potential new arrivals. In the examples we shortly discuss from the Quiet Room, participants range from 70 to 99 years old.

The Quiet Room is arranged with about eight comfortable chairs around three of the walls and with the Photostroller commonly to be found in front of the fireplace on the fourth wall. At this location it can be viewed by all those seated in the room. In this regard, it forms part of the background ambience of the room and can be surveyed from time to time if one is not involved in a more focused conversation. We have observed residents quietly watching the Photostroller in the Quiet Room, observing its procession of images between conversations. In such uses, the tuner is left in its holster and is only periodically reset, typically by John (who in many respects is the curator of the Photostroller) when he or others feel the need to view a new set of images.

In The Quiet Room, Close To

The Photostroller can also feature in conversations within the Quiet Room, sometimes being brought over closer to a small group of individuals. For example, Elaine, Nigel and Rose are clustered together with the Photostroller in front of them. Nigel is operating the tuner, which is set to show images from the 'local' category. He moves the slider down and images of London appear. He moves the slider up. "*Back to York*," he says. A picture from York's National Railway Museum appears and Rose is prompted to mention her and her family's involvement with the railways. To one of us (JB): *I used to be a member of the Museum but there were too many steps… My uncle was an engine driver from Sheffield…* As images appear from York and then Scarborough, Rose speaks of places she used to visit. This prompts Elaine and Nigel to join in and discuss a famous concert that was once staged at the York Opera House. Throughout Nigel is, from time to time, moving the slider and dial. He selects 'travel' with the slider slightly down and images related to South America appear. Elaine points to the screen and observes: *Look, a rainbow*. Elaine and Nigel then compare the importance travel has had in their lives, while Rose quietly watches the images on the Photostroller. Elaine: *Think there's places you've never been to*. Nigel: *Never wanted to go*. Elaine: *I've been to a number of places*. Nigel: *I bet you have*. Elaine: *You're a cheeky devil*. As this conversation lapses, the three of them watch the images process on the Photostroller until a picture entitled 'desert island' appears. Rose: *Oooo. That looks beautiful*. Nigel: *It does*.

This example is typical of a number of features we have observed concerning how the Photostroller is used in small group conversations. An image can prompt interaction within the group. If a topic develops of interest to, say, just two participants then others in the small group can silently watch the Photostroller in the meantime, staying part of the small group but without having to participate in the ongoing talk. As topics lapse, the Photostroller can provide means for new topics to be launched, new opportunities for reconfigured participation in the group as, for example, once Elaine and Nigel's conversation about travel lapses, Rose can initiate an exchange with Nigel where they compare their appreciation of depicted scenes.

Facilitating Engagement

While such focused small group interactions around the Photostroller can spontaneously emerge, often on the prompting of John, they can also be initiated by staff, carers, visitors or ourselves when we visit. Indeed, such parties can have a strong role in facilitating, shaping and animating (cf. [9]) the experience of the Photostroller for the residents. This is particularly notable for less able residents. For example, on one visit, one of us (MB) wheels the Photostroller into the main lounge to show it to Kate. In the next chair is Ethel, asleep. Kate is reluctant to use the tuner at first because she has just had a manicure. She also has difficulty seeing the text on the tuner as she does not have her reading glasses with her. She tells us she is 70 though in fact she is 85. MB sets the picture category to 'nature' and Kate repeatedly utters *lovely picture* as the images go by. Then she asks: *What's that?* MB: *It's a chipmunk*. Kate: *That's pretty… what's that?* MB: *They're insects.* Kate: *Ew. Creepy-crawlies*. MB moves the dial to local with the slider down towards the bottom of its throw. Kate: *That's a nice farmhouse*. MB: *The aurora borealis is in the background*. MB moves the slider up. Kate: *What's that? Is that York Minster?* MB: *Yes*. Kate: *Is that the racecourse? They've got new stands you know*.

MB is configuring Kate's experience of the Photostroller through his use of the tuner to select categories that might be of interest to her (nature, local), by responding to her questions as to what is being depicted, and by pointing out details which she might not yet have noticed (the aurora borealis). He also tries to sustain her interest by shifting the behaviour of the Photostroller, first after an image Kate finds discomforting and then after one where she seems not to respond to an unusual detail being pointed out.

Figure 3: Kate and Ethel

During the course of this, Ethel wakes up. She is 100 years old. She has

been watching the images on the Photostroller for a little while (Figure 3). *It's a new invention* she says several times. Ethel and Kate watch the images on the Photostroller for about another 15 minutes with Kate now operating the tuner as her nails have dried. Prompted by a picture of a group of soldiers, Kate describes how she was called up in the last year of World War II and served in the Observer Corps. A picture of Paris prompts Kate to tell us of a trip made there with friends when she was younger. Without her glasses, however, Kate is beginning to find the Photostroller to be tiring to view, so MB takes it over to Nancy, a resident who seldom speaks and whose words can be difficult to comprehend.

As MB steers the Photostroller through nature-images, Nancy (Figure 4) traces the pictures making a left to right gesture with her finger pointing at the screen as if scanning them. Sometimes she identifies the images and announces, e.g., *the sea!* Sometimes she reads the text below, *na nature!* Sometimes she comments. *You don't know do you? <laughter>* She points at one of the images depicting a countryside scene and starts laughing: *Trying to find it. It's like a needle in a hay, hay, haystack.* While MB (and JB) find it hard to understand all that Nancy is saying, she manifests clear and specific behaviours towards the Photostroller: pointing, scanning, laughter and utterances which seem, no matter how opaque, to be in response to the images. With the right scaffolding and attentiveness from MB, Nancy is able to engage with the Photostroller by watching the images and reacting to them.

Figure 4: Nancy's gestures

In Arthur's Room

For the staff at Jacob House, one of the most striking phenomena surrounding the Photostroller has been its adoption by Arthur. Arthur, who has learning difficulties, prefers to remain in his room rather than venture into any of the shared spaces in Jacob House. He takes his meals in his room and has a TV there though he rarely watches it, preferring to sit and gaze out of the window, which he does persistently and with great absorption during his waking hours. He rarely talks to staff who visit him, sometimes barely acknowledging their presence. From time to time, Arthur is known to shout out *Hey! Hey! Hey!* in ways that can be alarming especially for those who do not know him, but mostly he silently gazes out of the window. All day.

From time to time the Photostroller is taken by the staff into Arthur's room away from its 'usual' place in the Quiet Room. Arthur has become very attached to it, coming to regard it as "*a wedding present*" he has received. Staff will switch on the Photostroller for him, set it to a liked category such as local or nature, and place it where he can see it comfortably, typically to his left, the window being to the right of his chair.

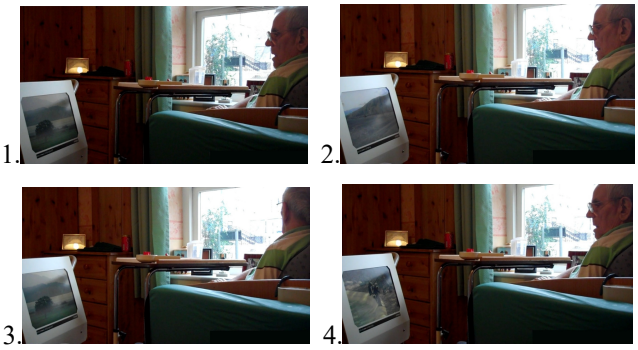

Figure 5. The Photostroller in Arthur's room

The frames in Figure 5 give a flavour of Arthur's use of the Photostroller. In frame 1, we see Arthur looking at a picture of a country scene in which a dark tree is prominent in the centre left of the image (the Photostroller is set to the category 'nature' with the slider fully down to maximize the variety of images shown). In frame 2, taken 36secs later, Arthur is looking at a dramatic image of a rocky landscape. The next image is the country scene with the dark tree again. As we see in frame 3, with this repetition, Arthur takes a look out of the window, returning to look at the next image in frame 4. Arthur's glances out of the window quite typically occur at such junctures: when an uninteresting image appears or one recurs which has just been seen. Arthur is able to shape such looks so that, if nothing interesting is found out of the window, he can return in time for the appearance of the next image.

Not only do examples like this one demonstrate Arthur's interest in the Photostroller (it is excerpted from a 28 minute video during which Arthur continually looks back and forth between the window and the Photostroller), they give a flavour of some aspects of *how* he uses it. He is able to find interest in the images without betraying his concern for the view out of the window. Indeed, the regular timing of image display and its occasional repetition gives Arthur opportunities to glance back and forth and miss very little of concern to him. The Photostroller also occasions interaction between Arthur and others who might be in the room at the time. Specific photos sometimes elicit response. At one juncture, Arthur says what sounds like *Did dub* to a photo of a parrot. As we have noted, Arthur has spoken of the Photostroller as a wedding present for him. While his speech might seem opaque or confused, staff find it remarkable that this man is speaking at all.

Steering The Photostroller

The Photostroller was designed to have autonomous 'drifting' behaviours that were nevertheless steerable using the tuner to select image category and the slider to control amount of drift. However, without facilitation from staff, visitors or ourselves, it seems that the tuner is rarely used. When the Photostroller is in the Quiet Room set back against the fireplace for all to see, the tuner customarily

rests in its holster, serving more like a channel selector on an old fashioned TV than a navigation device or, say, a remote control to support idle channel hopping. Interestingly, residents often refer to the image-categories as so many 'channels'. John may be asked to 'change the channel' if the current category has exhausted its interest. It is rare for any other resident to spontaneously use the tuner though, as we have already documented, residents can do is if they are engaged in a focused activity with the Photostroller (and if their nails are dry).

While residents are sometimes bashful to pick up the tuner when invited, we have seen few instances of anyone unable to use the tuner at all once it was explained to them. 101 year old Nancy did try to make the tuner work by hovering her hand over it rather than touch either the dial or the slider, before returning to watching the images and scanning them with her finger. In many respects, as that was her principal activity with the Photostroller, there is no *need* for her to shape the flow of images. Arthur similarly finds the Photostroller to be just right for his purposes with a fixed setting (usually either nature with maximum drift or the default behaviour on switch-on: local/maximum drift).

John, who in his early 70s is one of the younger residents, shows considerable dexterity in using the tuner one-handedly, being able to curl his index finger around the dial while nudging the slider with his thumb (Figure 5). Even the most arthritic residents have had some success manipulating the tuner. The size of the slider, its 'throw', and how this is mapped, mean that one can nudge it several times to move from one extreme to another, finding different behaviours on the way, even if one's nudges are tremulous. The design of the tuner permits operation with it resting flat on a nearby table and this too helps people with severe arthritis or motor control problems.

The function of the dial is generally clear. *It changes the channel.* But we do not have clear evidence that people have grasped the drift concept, at least not as we intended. It is clear that the slider, when fully up, halts the images. Lowering the slider is more commonly conceived by contrast with this than as manifesting a controllable drift process. As John put it, lowering the slider "*gets the pictures*". This is the important matter for most uses of the Photostroller: that a satisfying variety of pictures appear and the category can be changed if new things are required. Importantly, the Photostroller does not *require* users to have an understanding of it, or use the tuner in any 'correct' fashion, or at all, to get a procession of images. Similarly, it can be used remotely or it can be reattached to the Photostroller itself. This kind of flexibility seems right for the ways the device is used.

Occasioning Stories, Appreciating Pictures

The Photostroller occasions the telling of stories, the conduct of reminiscence, and, from time to time, the display of knowledge. We have already noted memories of grand events at the Opera, Paris trips, enthusiasm for the National Railway Museum, serving in the Observer Corps.

Figure 5: The Tuner

To add with a further selection from our fieldnotes, we have heard recounted Nigel's 40 year long involvement with Yorkshire football, his facility with Morse Code, Wilhelmina's uncanny effect upon animals whenever she visits a Zoo, the significance of the Grand Hotel in Scarborough (especially for Wilhelmina and her husband who have spent the week containing their wedding anniversary there every year for 49 years). All of these were elicited directly following a related photo appearing.

The photographs also occasion the comparison of perceptions and values, likes and dislikes. It is not always clear what a picture is *of* or why it is entitled or classified as it is. Such ambiguities and obscurities will often elicit discussion (and so are certainly not things we should have designed out). Some images are found to be beautiful. Some contain an especially lovely colour. Some images are disturbing (the wartime ones for instance) but none have been found offensive. An occasional image of an erotic content is especially well received by men and women alike as far as we have witnessed. In all these respects, the Photostroller facilitates, in a very broad but real sense, Jacob House's appreciation of photography. And it does so by flexibly embedding looking at pictures within the varied activities which are of concern to the older people we have studied: conversing, making relationships, entertaining each other, maintaining seclusion, and staying in touch.

Appreciating the Photostroller

A few residents have refused to engage with the Photostroller, apparently reflecting a reluctance to engage with any new technology. For instance, one TV room resident, on being presented with the Photostroller, said: *I don't want to see it*. For those who have explored the device, however, we have heard a range of very positive reactions. Billy, a relatively new resident, took MB on a tour of the care home and, without prompting, pointed out the Photostroller: *It's good that! Very good!* Patricia a day visitor described it as: *very nice, very interesting… because they are very good photos.* She also remarked that it was *very easy to use.* John gave a more detailed account of its appeal: *As I say it is quite interesting and it really does get you thinking and remembering things*. New views, not just remembered ones, have appeal for him: *I have seen parts of Leeds, Scarborough, I haven't seen before. It's very educational.* Staff are also enthusiastic. Sarah: *It's absolutely brilliant, the pictures are so clear.* The manager is also positive: *I love it, I really do.*

DISCUSSION

Both the Photostroller and the underlying view of aging we developed through its design contribute to the literature on support for older people. An increasing proportion of work

on the elderly has suggested, often using user-centred methods [6, 14] that older people do not just need physical care, but also support for their emotional and social lives (e.g. [1, 2, 12, 14]). A variety of approaches to supporting sociability have been explored, including memory aids to help with conversation [12], online chat and game systems (e.g. [2]), and systems providing telerobotic telepresence (e.g. the Giraff, www.giraff.org, similar to Willow Garage's Texai, www.willowgarage.com). Our study is unusual in focusing on care home residents, whereas most related work focuses on supporting older people, including those with dementia, to stay at home (e.g. [4]). Most relevant to the work here are tools such as Circa, a touch screen system that provides access to a variety of media to support reminiscence [1]. However, tools such as these contrast with the Photostroller both in offering relatively complex interfaces, often implying use with caregivers, and in focusing explicitly on predefined activities.

In contrast, the combination of *control* and *drift* offered by the Photostroller seems well suited for independent use by the older people at Jacobs House and for a variety of activities. Residents (or caregivers) can use the tuner to control the category of images but, once set, images will drift by without further control, giving access to endless thematic content without requiring explicit access. As we have seen, this seems appropriate for the Jacob House residents, who often seem happy to allow their memories, musings and conversations to drift along with the imagery, but who always have the option to 'change the channel' if the content becomes unappealing. The use of drift also seems to reflect the ways that residents' conversations, as observed throughout the project, shift as new topics were prompted by previous remarks or external events.

The balance of *constraint* and *openness* the Photostroller offers also supports this flexibility. In some respects, the device can be seen as a simplified, more fit-for-purpose alternative to television. By avoiding television's narrative or commercial scripting, the system facilitates residents' ability to appropriate it into their current concerns. Its design as a specialised device to offer thematically organised photographs gives it a clear and recognisable identity, and allows a simple style of interaction appreciated by older people [2]. But it is designed to be open both in terms of its physical use – its mobility allows it to be configured for the wide variety of residents and settings within Jacob House – and in the ways the older people can engage with it. By simply presenting the photographs without a larger narrative of use, the Photostroller allows residents to orient to it as they see fit. This openness allows it not only to serve as a tool for sociability [12] or reminiscence [1], but also as a support for daydreaming, factual exchange or flights of fancy.

Most generally, and by these means, the Photostroller seems successful in providing resources for the residents' *ludic engagement* [7] both with the world outside Jacob House and with other residents within. By ludic engagement we refer to the self-motivated, non-utilitarian and fluid ways that the older people incorporate the resources offered by the Photostroller into their activities. As we have described, the Photostroller has occasioned a wide range of curiosity, anecdote, reminiscence and playful discussion that revolves both around the images it shows and the people who use it. Though it can be viewed passively, using the Photostroller often seems to involve more active engagement involving memory, interpretation, curiosity and communication. Engagement of this sort may be valuable in supporting residents' mental and social wellbeing. What seems certain is that it provides the pleasure of exploring the world's complexity and richness, a pleasure as essential to older people as it is to any of us.

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