international reports
on socio-informatics

**Enhancing Interaction Spaces
by Social Media for the Elderly:**
A Workshop Report

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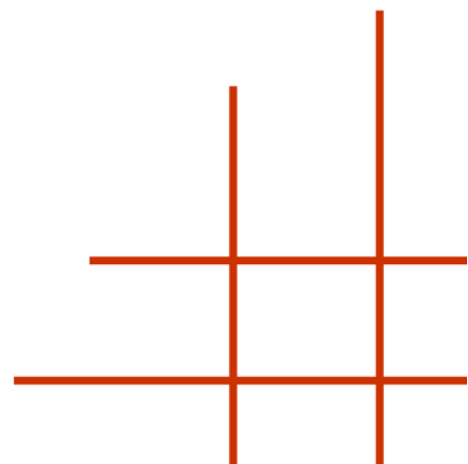
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Enhancing Interaction Spaces by Social Media for the Elderly: A Workshop Report

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Abstract. The extension of CSCW research towards new domains, such as the home, has brought up many ideas to support ageing in place. However, the social wellbeing as a pivotal pillar of healthiness besides physical and psychical health has not gained much attention yet. With a workshop at the European Conference on Computer-Supported Cooperative Work in 2009, we opened a forum for research in the area of social wellbeing of the elderly by means of focusing on social media. By bringing together CSCW and social media researchers we wish to open up discussions on the development of new interaction and coordination spaces for wellbeing and social support which enhance the spaces of physical home environments.

1 Introduction

The western society is facing needs for innovative health-oriented services in elder communities. In fact, there is actually a real demographic change: the elderly population is growing (according to the World Health Organization, the proportion of people age 60 and over worldwide is growing faster than any other age group) and there are more and more multi-morbidity and chronic diseases.

Though health must not be reduced only to bodily and mental wellbeing – social wellbeing is another important aspect of healthiness. Elder people desire for independence, self-determination, and quality of life in their own house as long as possible. Many innovative research projects lack on these integrative views and focus on physical well-being, with smart homes, ambient assisted living technologies, failure management, cognitive and physical stimulation.

Ageing in place is increasingly emphasised as a preferable alternative to institutional care. Although it offers the potential of both practical and psycho-social benefits, the reality of remaining in the community in later life can prove problematic. This clearly points to an opportunity for technological solutions to support independent living for seniors. A primary concern for this population is the loss of companionship, which can contribute to isolation, depression, and decreased socialization. The best weapon against senior isolation is family contact, but this is made difficult by living arrangements. Thus, new opportunities exist for domestic technologies to support socially oriented activities for older people.

The shift of ICT from the office to home environments has brought out a range of CSCW research in the application domain of the home with different foci, such as home care (e.g. Palen and Aaløkke 2006, Mamykina et al. 2004) and family life activities and coordination in the home (Crabtree and Rodden 2004). However, the perspective on the social every-day life of the elderly and related ICT support is – in contrast to its relevance – a relatively new one.

The extension of the origin CSCW research domain of office work towards other domains, such as the home, benefits from a stock of concepts and foci in CSCW research, such as the design for context and social awareness (e.g. Crabtree 2003). However, the occupation with the new research domains beyond the workplace reveals the need for acknowledging the unique demands of domestic technology appropriation and use. Rather than designing for efficiency and utilitarian pursuits, home technologies aiming at fostering sociability, inclusion and social awareness need to take into account different underlying design aspects, like designing for recreational or ludic experiences (Gaver 2006).

This stresses the importance of ethnographical work and participatory design methods for informing domestic ICT design, which will be able to address the specificities and needs of every-day life and especially social wellbeing of the elderly, based on interaction, coordination and collaboration between actors of the elderlies' networks, such as neighbours, friends, peers, remote family members, care providers, etc.

We are particularly interested in social media, which includes Social TV (general term for technology that supports communication and interaction in the context of watching television (Rice and Alm 2007)), and other community media, such as online communities with special focus on social support for the elderly. Social support is an exchange of verbal and non verbal messages, which transmit

emotion or information in order to reduce the uncertainty or the stress of a person (Barnes & Duck, 2007). Directly or indirectly, lending social support to a person implies the recognition of its value. Even if the support is informational, affection is the main dimension of social support, which is a comforting communication (Caplan & Turner, 2007). Social media can contribute formulating virtual generational communities, which permit to discuss, to exchange experiences with peers instead of family members, social workers, nurses or practitioners. These generational communities are then the way to provide social support within peers.

CSCW research on home applications has warned against alienating principles and assumptions from the ICT design for work environments in the home. The same carefulness is demanded for alienating entertainment and social media formats for younger generations to seniors. Against the background of attempting to enhance the social interaction space for the elderly by means of social media, by converging physical and virtual spaces, ethnographically-informed research is needed for new technologies and applications to literally find a place in the elder peoples' lives.

Therefore, the elaboration of the metaphor of space appears helpful to understand the organization and social needs in every-day life of elder people to finally come to successful social media offers. The spatial turn "lens" has been taken up in the last decade to foster understanding of ICT use in relation to the perception of physical and virtual spaces and in the interplay of spatial contexts, meanings and experiences (De Certeau 1984, Dourish 2006). For designing social technologies which aims at opening up new interaction and communication spaces – be it in the nearer neighbourhood, be it in communication and interaction support with remote friends and family members or be it in online discussion groups with peers – all of them having their origin in the home environment of the elderly which has to be carefully taken into account in social support technology design. Spatial research concepts, such as proxemics in the sense of Barthes (1972) or territorial markers (Hall 1990) point to the socio-cultural foundations of individual perceptions and appropriation of space in a relational and processural stance which have to be taken into account when designing spaces enhanced by social media.

2 Workshop Course and Results

The workshop attracted researchers from areas like Human-Computer Interaction, Media Studies or Art & Design. The diversity has been present in the submissions, and it is present in the extended position papers that we present in this special issue.

This special issue collects four position papers of the workshop as extended versions of the original submissions. This allowed the authors to integrate the results from the workshop discussions into their argument.

These contributions approach the topic "social media for the elderly, for social well-being and social inclusion" from different points of view regarding empirical work and research approaches; however all aim at the goal of supporting community building.

Two papers position their research on community building by social media in elderly neighbourhoods, senior housing, existing and newly built, surrounded by self-organized or institutionalized organization:

The first contribution, by Rikke Aarhus, Stinne Aaløkke Ballegaard, Erik Grönvall, and Simon Bo Larsen, from Denmark, describes 'real' senior communities. Based on their observations and informal interviews in six different senior dwellings, they present the key findings related to social interaction and the formation of communities and explicate how these findings apply to designers of social media technologies.

The second contribution, by Andrea Botero and Kari-Hans Kommonen from Finland, describes the collective project launched by the "Active Seniors Association". They aim at organizing their future everyday life based on neighbourly help, which includes both the construction of an apartment building for the community as well as the continuous development and configuration of an active community life with shared practices amongst its inhabitants.

This workshop also connects Social Media to Ambient Assisted Living research. The idea is to go beyond smart home technologies which enrich the home with a multitude of sensors, actuators, and multimedia equipment, without taking into account sufficiently the loneliness of the ageing people.

In the third contribution, by Karin A. Hummel, Helmut Hlavacs, Anneliese Lilgenau, Hanna Mayer, and Verena Moser-Siegmeth, from Austria, a system is presented, which, in contrast to many existing smart home solutions, includes the relatives in the loop and – thus – avoids increased isolation usually fostered by a fully automated home.

Design questions and the well-being of the elderly people are also discussed in the fourth contribution, by Cornelius Neufeldt, from Germany. This paper centres on game play with elderly people and questions of appropriate interaction/input devices. In an empirical study *Nintendo Wii* is used and criticized for the certain target group.

3 Acknowledgements

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Ageing in communal place: ethnographic studies of social interaction in senior housing communities

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In this paper we adopt the position that design of social media for the elderly and virtual senior communities may be informed by studying 'real' senior communities. Since current research efforts target the role of social media and virtual communities for supporting seniors ageing in place, i.e. in their homes, housing communities seem a natural place to begin this enquiry. We conducted observations and informal interviews in six different senior dwellings. In this paper we present the key findings from these visits related to social interaction and the formation of communities and explicate how these findings apply to designers of social media technologies.

1 Introduction

Ageing in place refers to the ability for people to stay in their homes as they get older. It is seen as a solution to the rapid growth of the elder population and is also the wish of many senior citizens who are too healthy to stay in nursing homes and prefer to stay longer and more autonomous in their home. However, some senior

citizens experience that their social network is reduced with age as spouse and friends pass away and they risk isolation and lack of support. A rapidly growing body of research is investigating the role of assistive technologies for supporting ageing in place (for an overview, see Daniel et al 2009). The majority of these studies focus on cognitive, physical or sensory aspects where the issues of social isolation are less documented. However, attention has also recently been given to how virtual communities and social media can support the social networks of the elderly (Blit-Cohen & Litwin 2004, Fokkema & Knipscheer 2007, Karividas et al 2005, Wright 2000).

We follow this recent line of research by investigating social communities of senior citizens, who have chosen to face the challenge of growing old in their home while sustaining a social network by moving into senior housing communities. They move from their old home while they are still relatively young and in possession of personal resources, in time to create a new home where they can age in place with the company of other senior citizens.

This paper explores the work and collaboration between senior housing residents in creating a social community. As such, the paper contributes to the field of CSCW by exploring collaboration between non-professional senior residents and the non-professional work they engage in to create and sustain a social community. Within CSCW focus has traditionally been on professional work settings and the actors within them (Bjerknes et al 1987, Greenbaum & Kyng 1992). CSCW studies aimed at senior citizens in their homes therefore most often put attention to the collaboration between the elderly and their various caregivers in different settings, including the home (Brown et al 2004, Consolvo et al 2004, Nilsson & Hertzum 2005, Pinelle & Gutwin 2003). This paper takes on a broader understanding of work and includes the work involved in collaboration between non-professionals in a non-work setting.

As we will discuss in the paper, seniors actively engage in creating a social community. We point to an interrelationship between being part of a senior housing community and creating a social community. As we explore further, however, the social community is not given because of the physical proximity, but demands continuous work and collaboration between participants. Residents constitute a heterogeneous group, but they still have to agree on the normative rules of engaging in a social community. Additionally, they have to reach a balance between individual rights and collective obligations and hence the nature of the contribution to the community, which may be a challenge and the cause of conflicts.

The aim of the paper is to let the study of social network among seniors who live close to each other inform the discussion on the design of social media for elderly people. We argue that the design of social media can benefit from mimicking physical social networks and that studying how senior citizens engage

in a physical, social network will point to aspects, which are important for digital social networks as well.

Before unfolding how senior citizens engage in a social community we will give a brief introduction to the home visits of senior dwellings on which this paper is based.

2 Home visits

As part of a project on assistive technology for senior citizens living at home, we conducted a short field study focusing on senior citizens and senior dwellings. The purpose was to achieve knowledge on seniors' challenges of growing older in their homes and their reasons for choosing a senior dwelling whether the community was self-organised or institutional. Together with an expert on senior dwellings from the DaneAge Association[1] we selected six different types of senior dwellings to ensure diversity: one nursing home, one combined nursing home and senior housing community, one apartment complex for senior citizens, two senior housing communities, and one housing community for both young and senior citizens (see table I). Our paper is thus based on senior citizens who have already moved to a senior housing community and not on people who still live in their own house or apartment and who may or may not consider moving to a housing community which could have been another interesting approach.

We visited the senior dwellings in the summer of 2008. The visits were largely unstructured, but all began with a joint introduction to the senior dwelling followed by an observational guided tour to common facilities and in total 15 individual homes. We made unstructured interviews with groups of people both in connection to the joint introduction and the tour and documented the visits through comprehensive field notes and photos.

This paper is partly based on the outcome of a collaborative analysis workshop held with project partners ensuing the home visits. The aim of the workshop was to identify and thematise problem areas in regard to senior citizens and senior dwellings and to discuss future work. In the following we have, based on the original data material, explored a selection of themes from the workshop further.

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[1] DaneAge Association is a non-governmental organisation primarily concerned with issues in regard to being elderly.

	Betty Søren-sen Parken	Lions Park	Bellevue Park	Munksø-gaard	Holbæk Seniorlands-by	Lumbylung Seniorbofæl-lesskab
Type of housing	Nursing home and senior apart-ments.	Nursing ho-me and senior housing community, apartments.	Apartment complex for senior citi-zens.	Housing community: senior, fami-ly, youth, apartments.	Village for senior citi-zens, single-family house.	Senior hous-ing com-munity, sin-gle-family house.
No. of homes	36 + 38	42 + 110	374	Senior: 20	46	15
No. of inhabitants	Nursing home: 36	App. 150	n.a.	Senior group: 25	81	20
Min. & max age when moving in	Not relevant.	Senior hous-ing commun-ity: min. 60	Min. 55	Senior: min. 50 and max. 65	Min. 50	Min. 50
Mean age at time of visit	n.a.	Senior: 82	n.a.	Senior: from 55-87	70	78
Philosophy	Selfdetermi-nation and individuality. Integration of rehabilitation in everyday activities.	Possible to move from senior hous-ing commu-nity to nur-sing home. Share resources.	Possible to buy services as needs arise.	Move from one housing group to an-other. Age groups help each other.	Future-proof. Provide a feeling of safety. Voluntary participation in activities.	Live individually in a community. Keep an eye on each other.
Common facilities (examples)	Gym, public restaurant.	Restaurant hairdresser, gym, activity centre, kiosk.	Swimming pool, gym, library, inter-net café, res-taurant.	Vegetable garden, kiosk, common houses, laundry.	Gym, shop, common house, café, computer room.	Common house, gar-den, guest room.
Common activities (examples)	Talks, bingo, dinners.	Talks, tours, concerts.	Dancing, talks, bil-liards.	Dinner in common house if re-sources. Maintenance, gardening.	Maintenance and garden-ing, opera club, painting classes, com-puter classes.	Gardening and mainte-nance, Sun-day coffees, bicycling.

Table I: An outline of the senior dwellings visited.

3 Creating and participating in social communities

Senior housing communities are often established on the assumption that they are inherently of the good. The majority of the residents have moved to the senior dwelling primarily because they wish to be in good company and not being lonely in particular when one's spouse passes away, and secondly because they wish to move to a smaller home that not only involves less maintenance, but also allows

you to share the burden with others. However, as we will explore in the following the residents need to put much effort in obtaining these advantages.

Social communities within the senior dwellings

Being part of a social network is, as mentioned, one of the main reasons for moving to a senior dwelling or housing community. From our research before the home visits and the visits themselves, we found that a common underlying assumption in the housing communities is that there is an equation mark between participation in a physical and social community; that friendships automatically develop if people live next to each other. However, we discovered that the interrelation between physical closeness and social community is far more complex as we will show in this section. Rather, establishing and participating in a social community demands much work on behalf of the involved parties and may be influenced by the physical proximity as we will show in the following three paragraphs.

Digital technologies and face-to-face communication

At one dwelling, Munksøgård, we were struck by surprise of a redundancy in information sources, which were both digital and analogue. The choice to use either digital or analogue media was not related to the skill or computer literacy of the residents, rather it was tied to the physical placement of analogue media that supported residents in meeting face to face.

All homes at Munksøgård had Internet access and there was a functioning intranet, where all activities and initiatives were announced. Most residents would

From the vegetable garden

Cucumbers

Beetroots
NB: Take 2 each
Onions – Courgette
Beans
Potatoes
Rosemary by the south end wall of the east wing
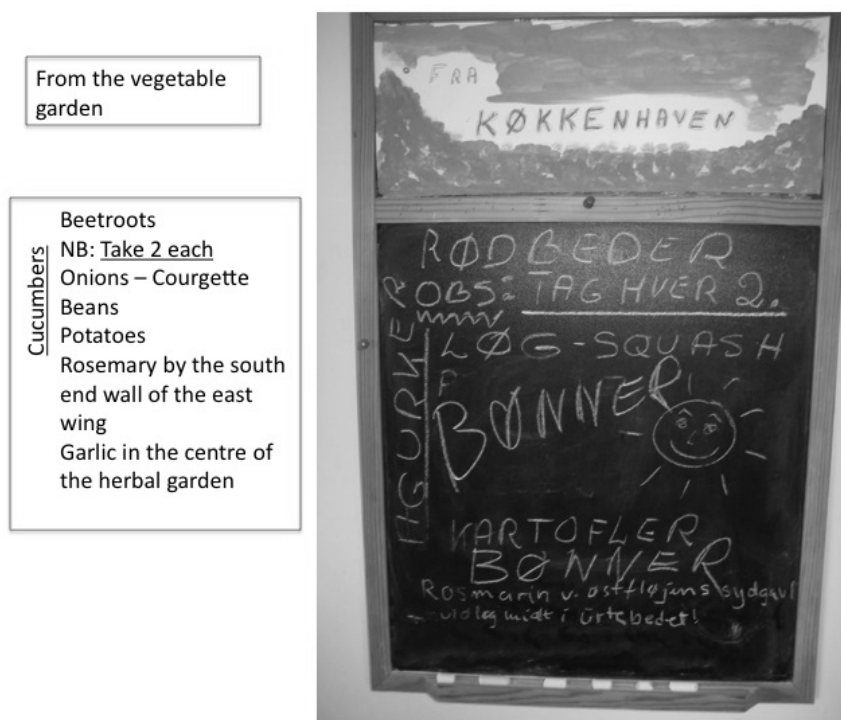Garlic in the centre of the herbal garden

Figure 1: Blackboard in the communal space with a listing of crops available from the vegetable garden.

check the intranet several times weekly. The majority was capable of using a computer. One of the residents we spoke to, for instance, used the computer to email and send pictures to her daughter, who lives abroad. Despite the fact that all information would or could be made available and accessed via the intranet, most information was replicated and supplemented on written boards or printout posters in the communal spaces (see figure 1). Though this may seem like a redundant practice, the residents explained that they prefer to stop by the communal space on a daily basis for other reasons as well: while inspecting the written messages in the communal space other residents can see the person from their windows and have the chance to go and chat with that person. On a daily basis, this would result in several of the residents gathering for a chat in the communal area while they, secondarily, checked the information board.

As such there is an interrelationship between the physical closeness and the participation in a social network enacted through the daily routine of checking the boards and posters for new information. The physical design of the senior dwelling supports the establishing of a social community. In contrast, the technological infrastructure of the senior dwelling only partially support the social network, and the digital information on the intranet cannot directly replace the hand written posters at the communal space as these have other social purposes.

Collaboration and social activities

Checking the analogue news board is one way that social intercourse between residents takes place. Living together in a senior dwelling with shared facilities also gives rise to much social intercourse and collaboration between residents. In three of the senior dwellings, Munksøgård, Holbæk and Lumbylung, the residents themselves are in charge of the maintenance of the common garden and facilities. The three housing communities have a common house with a kitchen or dining hall, rooms for activities, and Holbæk even has a small store with groceries and a gym. Much collaboration is needed in terms of maintenance and organisation of the use of these facilities and the residents have organised days where they all participate in this work. This may occur on a weekly or ad hoc basis. Nevertheless, the collaboration provides the residents the opportunity to contribute in the establishing of a social community and for getting to know each other better. Moreover, common dinners are organised either on a weekly or daily basis. At Holbæk they have a café that prepares a daily supper. The resident do not have reserved seats, but instead mingle with each other. As the housing community is rather large the dinner provides an opportunity for the residents to expand their social network within the community, which is also a deliberate goal with the dinners.

Although collaboration on practical matters does not entail a social community per se, it does however open for the possibility of creating friendships. Often residents see such collaboration and the social activities as central for the community as it gives the opportunity to share experiences, establish a common ground from where friendships can develop. The intertwining of a social and physical community often fosters an interest in each other's lives, and residents become attuned to developments in the condition and life situation of fellow residents. As such, collaboration prompted by the physical aspects of a senior dwelling will often prompt the social community, and hence reduce the risk of social isolation, which was also what motivated the residents to move into a housing community in the first place.

Social support and security

Finally, the physical proximity of the homes provides a unique opportunity for social awareness. Many of the senior dwellings have an explicit agreement of keeping an eye on each other, which is supported by the physical housing arrangement where homes are placed opposite each other and in small clusters. The residents are thereby enabled to keep an eye on each other without being nosy or intrusive which the residents attached great importance to in order to ensure privacy within the housing community. Examples of keeping an eye are to e.g. note lights being switched on and off or movements behind curtains (see figure 2).

Consequently, neighbours most often have a general idea of routines of other residents, which they draw on to detect irregularities and emergencies, and which produce a feeling of security in the individual who, for instance, lives alone. One example illustrating this stems from Holbæk where the neighbours had paid particular attention to Hans' house, as they knew that his health condition had been deteriorating. A neighbour noticed that the TV was on late at night and early in the morning, which he knew was unusual for Hans. By inspecting the home, it turned out that Hans had passed away. Although the senior housing communities often are extremely aware of each other's health condition and are attentive of irregularities, the residents realise that the solution has limitations. Agnete from Holbæk explains that *"you can't keep a 100 % eye on each other. One of my neighbours fell just after I had paid her a visit."* Residents from Munksøgård have decided against a suggestion on a daily telephone chain as one could still risk lying most of the night with for instance a cerebral haemorrhage. The telephone chain would thus act as a false security. Living in a housing community also provides the residents another kind of security, namely in regard to burglary. A couple from Holbæk explained that they felt much more secure in the housing community than had been the case in the house they used to live in due to the close vicinity of the houses in the community which reduced the risk of experiencing a burglary. As they lived at the outskirt of the clusters of houses, they still feared to experience a housebreaking, however, although to a lesser degree

than in their old house. While the seniors may not experience a 100% guarantee, they explain that the combination of social and physical support and security mechanisms within their senior housing community meet their wish for support and security while ageing.

Figure 2: The houses are placed in clusters opposite each other allowing for awareness of movements in the home without prying. On the left: Holbæk. On the right: Munksøgård.

The above sections have suggested an interrelationship between physical connectedness and a feeling of and benefit from social community. But the social community is not to be taken for granted simply because of the physical dimension. Disagreements and conflicts may occur, as we will explore in the following.

Social communities and negotiations of engagement

Seniors in general have different understandings of being a senior and of ageing (Mitchell 1994, Mynatt et al 1999). Residents in a senior dwelling neither constitute a homogenous group. On the contrary, they have different opinions on what a community is, how a senior dwelling should be organised, and what the normative rules regarding participation in a social community should be. There may be different views on how to achieve a balance between individual rights and contributions to the community. Moreover, the seniors have different physical capabilities that may deteriorate with age and not everyone is able to contribute equally. On a personal level there may also be conflicts, dislike and even animosity between residents. To overcome these differences and to create and uphold a sense of social community residents engage in continuous negotiations and compromises. In the process, a minority may risk being left out or even excluded from the social community, even if the resident continues to live in the senior dwelling. Thus, the idea of a social community as being inherently of the good is a truth with modifications, and the establishing of a social community demands much effort from the participants.

Contribution and the challenge of ageing

As described above, both practical collaboration and social activities play a central role for establishing and upholding the senior housing communities and the social community within. However, ageing and deterioration in physical abilities pose a challenge for the continuation of these activities and to the contribution to the social and physical community. At Munksøgård, they previously took turns preparing shared meals, but now only few are able to cook for the entire group and hence they seldom eat together despite their continuing wish to do so. They also face the fact that Anne, one of the residents, has come to suffer from dementia. The other residents are concerned for Anne as she sometimes leaves her apartment improperly dressed for the weather and looses her orientation. They are also concerned for their own safety in their homes as Anne still cooks in her apartment and they fear that she will forget to turn off the stove or water, causing fire or water damage to the apartment below. Furthermore, Anne has no close relatives, which leaves the other residents with the responsibility of communicating with the municipality regarding the care she now receives. Although some assistive technologies have been acquired to minimise risks, the other residents remain concerned and consider her a burden to the social community. The situation has given rise to discussions among the residents on the course of action and on how the social community can cope with the general problem of ageing as the diversity within the group in terms of personal resources diminish and as the need for help and assistance rises.

The problem of ageing is also found in Holbæk and Lumbylung. Ageing poses a challenge for the social community as people become unable to live up to the obligations of participating in social and practical activities. Ageing, or deterioration in capabilities, points to a paradox in senior communities: all seek the benefits of being part of a community when in need for help, but it may become a burden to the upholding of the community if people are unable to live up to shared duties due to their need for help. That people in general get older and that residents only seldom move away from a housing community are among the reasons for this burden. As such, the social community cannot be taken for granted, but is very much affected and put under strain over time if residents become unable to contribute to and participate in the social activities.

The adaptation of the individual and the collective

From our visits to the senior dwellings we learned that a common challenge is to reach agreement on a balance between individual rights and collective concerns having to do with the residents constituting a heterogeneous group.

Collective dining was thought by some residents to be of vital importance for the social community and turned out to be a central topic for discussions in senior dwellings. At Lions Park, the management had decided that the residents in the senior housing community were obliged to buy dinner tickets for the common

restaurant as they considered the common dinners vital for the creation of a community feeling. The management believed that dining together would prompt more infirm residents to be more sociable and active. However, the idea behind the collective dining had played out quite differently as it had become a 'battlefield' of existing conflicts between groupings and individuals. Consequently, the management had given the residents assigned seats to avoid arguments. Furthermore, some residents were against the idea of collective dining and ate in their own apartment regardless their obliged monthly payment.

At Holbæk, one resident's dog fence caused a conflictual situation as it was considered too tall and un-aesthetic by the other residents who wanted it to be removed. The dog owner, however, insisted on his right to decide on the fence he preferred. Eventually, the board of residents decided that the owner had to remove the fence or else the board would. Consequently, the owner had put his house up for sale. The residents interviewed explained that the owners of the dog did not fit in with the rest of the social community: they kept to themselves; the husband was too infirm to participate; and the wife would do the grocery shopping in the city rather than in the housing community's small store.

The residents' different interests and perceptions induced conflicts in the senior dwellings visited. This diversity put a strain on the upholding of the social community and at times the result was exclusion and fractions that again affected the possibility to benefit from being part of a community which was the main reason for moving in to a housing community.

Closing analytical remarks

Munksøgård, Holbæk and Lumbylung are what we call self-organised communities, where residents themselves set up the rules for contribution and for engagement in social activities. The other three housing types, Betty Sørensen Parken, Lions Park and Bellevue Park are based on an institutionalised organisation where staff arranges social activities and are in charge of the maintenance. However, regardless of the self-organisation of the senior dwelling, rules were made to regulate behaviour, norms were established for the expected and desired pattern of action, and sanctions were defined for deviant behaviour. As such, being part of a senior housing community involves much work not only in the sense that residents must contribute to the community, but also in the sense that the communities must negotiate individual preferences against collective considerations. These pointers indicate that being member of a senior community, although manifested physically, is not always straightforward, but may be conflictual and burdensome and hence in opposition to the motives for moving in.

4 Discussion

The home visits proved to be a suitable way to encounter many non-sick senior citizens, i.e. not through a diagnosis or condition, but simply as people with whatever interests, concerns, or points of departure they may have. Furthermore, the home visits proved to be a valuable source of knowledge as the immediate connection to the spatial surroundings fostered in-depth discussions on topics considered relevant by the senior citizens within the frame of our study. In this section, we will discuss our findings and explicate how they can apply to the design of social media technologies for elderly people.

Designing social media for elderly people: inspirational pointers

A well-established point, that our study confirms, is that seniors cannot be boxed into one category but rather constitute a heterogeneous group. It is hence an illusion that being part of a community is inherently of the good, as seniors have different needs, perspectives and standpoints that may affect their wish or possibility to participate in a certain community, but also may affect their benefit if participating. For instance, some senior citizens dislike to be looked upon as elderly people. They would probably not participate in a community if it would draw direct or indirect attention to their age. As Gilbert and Karahalios (2009) point to, however, social media often treats all users the same. In our view, the heterogeneity between seniors addresses the formation and composition of communities, either physical or digital, as well as the definition of purposes of such communities.

   Another finding from our study is that seniors need to collaborate and invest time and resources to establish and participate in a community. A senior community marked by an unequal balance of giving and taking may loose its attraction and hence diminish with time. The demand for both collaboration and resources point to the need of entering a community when still possessing resources and perhaps before the immediate advantage of being a community member arises. Furthermore, a certain replacement of the community members is necessary to avoid that they are too alike and hence face deterioration in resources at the same time. Many tend to see the advantages of being part of a community when the need for support arises or is expected to arise in the near future. However, a community will probably not survive if the people to receive either physical or psychological support outnumber those who can offer the support and contribute to the upholding of the community. Questions of member composition and replacement rules are hence relevant topics to discuss in regard to the design of social media for elderly.

   Related to this is that being part of a physical community not necessarily leads to a social community feeling. However, our study shows that the physical contact

indeed inspires social community providing a possibility to get to know each other lying the foundation on which the community feeling can be build. While social media technologies may facilitate the immediate connection between the senior citizens, the social connection cannot be presumed. This constructionist perspective on community highlights the challenges of how a social community within a digital community may be established and how technology can contribute to it. To be considered is also whether the establishment of a social community should follow a bottom up or top down approach; i.e. whether the participants themselves or someone else should have the responsibility of creating and maintaining the community. As seen from our study, a top down approach may be opposed by the seniors as was the case with the management's idea of fixed seats in the restaurant at Lions Park. However, our study also showed that the senior citizens might be too weak to be the responsible part.

A community is, as shown above, not static as the level of social activity of the participants is subject to change over time and with changes in health condition and capabilities. We found that communities are sensitive to changes especially in regard to contribution and dependability and that this may cause conflicts among the community members. Sustainability and the ecology of social communities are hence topics that need to be further explored.

Rules of engagement and decisions on inclusion or exclusion are also continuously negotiated among community members. Participation in a community is governed by normative rules and attached with certain values. We suggest that besides from the senior citizens' abilities to use social media technologies, interesting issues to look into in a design process are also the experienced value of participation in a community, the social norms governing interactions and how values and norms differ between 'real' and virtual communities.

Lastly, we want to draw attention to the connection between social awareness prompted by both the physical and social environment and the feeling of security. The social awareness in a community might make it possible or easier to cope with insecurities, also those related to growing old. As such it may act as an important motive for being part of a community, even if it does not offer a 100 % guarantee of support and security to the senior citizen. The senior citizens deliberately take the risk of false security into consideration when assessing a 'system' to improve their feeling of safety. Interesting questions are to what extent social media provides false security and how the senior citizens evaluate the risk of it in the social media 'system'.

To belong to a community enhances the physical home environment, either virtual if the community is digital, or physical through shared spatialities outside the individual home as was the case in the senior housing communities. Membership

of a community might be a way to deal with some of the challenges of growing old; either these are related to ageing in place or social wellbeing.

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6 Acknowledgments

Aspects of social media design and innovation in a project for aging together

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Abstract. This paper documents a design research collaboration that intertwines with a collective project to develop and experiment alternative social arrangements for growing old. The paper presents some of the social media concepts developed in collaboration with the community and traces their role and challenges in sustaining the practices of the community of active seniors interested in growing old together.

1 Introduction

The expected number of active years after retirement (also referred to as the third age) is steadily increasing in the West. As a response to this demographic trend in the European Union alone there is today a large number of initiatives that aim to assist seniors' independent living and increase the efficiency of senior care with the help of new innovative technologies. These strands have paid attention to the cognitive and physical challenges associated with senior care, but seem to say very little about the general social arrangements under which these activities take place. At least in Finland, there has also been a crisis in the way municipal and state-led senior care arrangements and services are managed and organized (see e.g: Sonkin, Petäkoski-Hult, Rönkä, & Södergård 1999). There is a growing realization that along with the many physical challenges associated with growing old, there are challenges related to achieving a stable social life, maintaining a sense of belonging and avoiding isolation that need to be addressed urgently at all levels.

This situation invites to consider alternative arrangements for "growing old" and new practices to support them. Some of these concerns have been the central topic of the collaborative project initiated by a group of senior citizens introduced in this paper. In creating a project to redefine their future living conditions, the experiences of these active senior citizens could shed light on contemporary understandings of design. Particularly we are interested in the invitation of Suchman and her colleagues to consider design '*not as the creation of discrete, intrinsically meaningful objects, but the cultural production of new forms of practice*' (Suchman, Blomberg, Orr & Trigg. 1999). Building on this insight we explore how this project for devising new practices of growing old together has evolved and what types of social media were used. Even though we focus and trace instances of our collaboration with the seniors in envisioning and producing digital tools and social media concepts, those should be seen in the light of their role in supporting the development of this "life project" and the envisioned practices for aging together.

The paper is structured as follows; we first introduce the setting and development of their project, their collaborative practices and tactics, followed by an account of how our collective design interventions were woven in within their project. We then conclude with reflections and conclusions for further work.

2 Setting: Aging together and innovation

The idea of exploring a new way of growing old together discussed here was initiated by a group of retired women in Finland. Unsatisfied with the alternatives offered by Finnish society in terms of senior housing, they got organized in 2000 as the Active Seniors Association (www.aktiivisetseniorit.fi). Their purpose was to initiate a general discussion on the matter, and more importantly, engage in concrete and experimental actions around the theme. The community is making a concrete proposition for an alternative way of growing old that includes the individual as an active participant in the configuration of her life, through collective production of services. By building a coherent strategy and teaming up with different partners they also implement that proposition instead of waiting for a third party (government or service provider) to develop it.

2.1 Aging together, an alternative arrangement?

The project was concretized with the decision to design and construct a housing arrangement for seniors in Helsinki, that they named the Loppukiri house (in English: last spurt). The basic concept was formulated as a senior housing arrangement that will be based on three basic principles: **neighborliness**, **self-help** and community spirit guided by **open decision-making** process (Dalström & Minkkinen 2009). This collective project of organizing and designing a senior

housing solution is quite substantial. It includes not only actively participating in the planning and construction of a building[1] -during a six years period- but more importantly the continuous creation of a strong community with all the associated practices, rules and infrastructure that make this arrangement possible and sustainable.

Today Loppukiri consists of a community of approximately 70 people that live in 58 compact apartments. Like many other similar arrangements, in compensation for the small flats, the house has large common areas that include a library, a kitchen, a dining room, a guestroom, an activity room, the laundry room and two saunas (see Figure 1). The community takes care of the maintenance tasks of the house by themselves; they also cook and eat together once a day. Moreover, by taking advantage of the common areas of the house and the diversity of its inhabitants, the community offers reading circles, yoga sessions, and other similar activities for all its members. Despite numerous challenges, the objectives of providing access to a lively social life and opportunities to practice different hobbies as a strategy to keep active seem to have been well met so far.

Figure 1 The Loppukiri house and a view to the kitchen from the dining room.

When interviewed about the meaning of the project, Eila, an active member of the association and current resident of the house explains that "... *this project is about exploring new ways of growing old in a society that in the current circumstances is not going to be able to carry us in the same way as before; in here we experiment with the strengths, possibilities and limits of collaboration*". As a model to follow and learn from, the community is visited and consulted continuously by several other groups interested in following in their steps. The demand and success of this experience has been positive, up to the point that the association itself is involved in the design of a second similar experience in another neighborhood of the city.

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1   The association managed to obtain a price regulated lot assigned by the city for the construction, as well as negotiate a very particular agreement with the construction company and the architect office that developed to a larger than "mere customer" relationship.

2.2 An innovation hub, for what and with whom?

For the purposes of this paper, it is important to notice that the Loppukiri house is located in Arabianranta; a relatively recent regeneration district of Helsinki. Amongst other things, the plans drafted in the mid 90's included the building of a fast data communication network to interlink the area. In 2000 when we started our collaboration with the community[1], the vision for this future network was to create an *innovation hub* attracting businesses in the area with the fast connection. Already back then some of those visions where being greeted with mixed feelings amongst different stakeholders (including city planners, prospective residents, service providers, etc) (Kangasoja 2007) and it was not evident if a housing unit like Loppukiri would be given such connectivity, and if so, for what purposes.

Today the area is still marketed as Living Lab environment for developing innovations[2], but just yet what that exactly entails or means is far from clear. We believe that their case sheds light on the dynamics of new forms of social collectivity, which challenge our established modes of politics and tradition (Maffesoli 1996) and the possibilities of organizing collaborative production activities (see e.g Leadbetter & Miller 2004) that might represent more accurately real sites of social innovation.

2.3 Research collaboration

Our research group got in contact with the Active Seniors in 2000, at an early stage of their project. We were developing an open-ended participatory and co-design approach and were looking for communities that could work with us over a period of time. We started with the design research interest of studying what kinds of ideas and needs of using digital technology would emerge from a community if their capacities of envisioning such new tools and practices were nurtured through a collaborative design process, instead of a more traditional focus of having an application area predefined.

For our intentions, the Active Seniors was an ideal community to collaborate with, because they had already established for themselves a design agenda, albeit without any intrinsic interest for our themes. However, it appeared that the community had formed because the members wanted to change their own future circumstances and were ready to invest their effort and engage in activities that explored also quite long-term future possibilities – which is not necessarily the case with a random group of people.

Being a very heterogeneous group of people, not all members of the community subscribed to the idea of computers or networks as key elements in their future

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[1]   This collaboration has been carried out trough different funding instruments and with diverse degrees of "intensity".

[2]   See for example http://www.openlivinglabs.eu/helsinki.html for an overview of how the area is presented as a Living Lab

plans. However, they did have a realistic idea of the increasingly important role that communication flows had in achieving their goals (Dalström & Minkkinen 2009). Together we asked ourselves what kind of applications and digital media would be interesting and meaningful in such a community? Would there be a need for other visions than broadband for businesses and will such visions have a role in the development and maintenance of the community?

3 Practices for building a community, tools for a Life Project

The seniors' project has been, in a very substantial way, a project of designing and developing an organized way of working together in a quite wide spectrum of fields of life. They initiated the whole idea, gathered together a community, and organized the design process that eventually erected a building, managed the process that arranged how the members bought their own apartments. However, it would not have been possible to achieve these without also designing what kinds of everyday life practices there would be in that future community that would make the new lifestyle socially viable and enjoyable for the members. Now they have eventually already begun to live that life and have implemented and subsequently redesigned many of these practices; all based on self-initiative and collective decision making, as opposed to receiving a service product predesigned by some external organization. They have successfully developed a functioning, evolving and effective social design culture, very well worth an extensive study on its own.

Figure 2. Mapping practices collaboratively in co-design workshops

Our design collaboration in the early stage (before the building existed, when the community members did not yet live under the same roof) focused on two main aspects: first, exploring in what areas of their future life digital technology

could bring a meaningful contribution and how, and second, supporting their community with a web site.

As we had a very open agenda and wanted to give room for any interesting idea or area of new uses for digital technology to emerge from this work, we engaged in a variety of activities drawing form classical participatory design methods (Greenbaum & Kyng 1991) and co-design activities in the form of workshops to map activities and develop concepts and scenarios; scenario-based use and validation of mock-ups and finally hands-on use of running prototypes (see Figure 2. for some details of those events).

Through out the process we have focused on the idea that tools and practices develop in a co-evolutionary process where new possibilities offered by a new tool will, when exploited, generate new practices. This in turn, will generate new needs for a future tool, and so on (De Certeau 2002, Shove & Pantzar 2005). However, in the kind of open-ended design exploration that we were pursuing, we did not have the new tools yet available. Instead, collectively we had to imagine both the tools and the practices they might relate to. We engaged in several exercises with the seniors that focused on mapping, via structured activities, themes such as "Remembering", "Coordinating", and "Sharing", with the intention to make the normally quite invisible practices of everyday life visible. This provided material that could be turned into seeds for the design activities, and the imagining of the role of new digital tools, and how new practices that take advantage of them could emerge (Botero & Kommonen 2009).

In the following section we will briefly introduced some of the practices they developed alongside with the relation to some the early concepts, scenarios and prototypes we explored together.

3.1 Informing, organizing, connecting

Parallel to the concrete building project, the community worked hard for the configuration of an active community. Sirkka, one of the motors of the project, puts it usually in this way: "*We built at the same time a house and a community*". This was an obvious imperative when it comes to be able to construct the house, and continues to be a requirement in order to keep the community sustainable. As a working strategy, the community divided into working groups that focused on the different areas of the project.

Tasks such as fund raising, house and interior design, internal communication, community development, IT infrastructure, etc. gave shape to the working groups and divided responsibilities amongst those involved to ensure that all could contribute and decision-making could be distributed. Aided by trips to get acquainted with similar experiences, the organization of formal events, parties and organized self-development activities with invited experts; the association built the basic foundations of the community.

A lot of attention has been placed in keeping everybody informed about the progress and engaged, as in its forming stage the community was dispersed and members where getting to know each other. They developed a monthly newsletter, monthly face-to-face meetings, regular lecture series, social events and parties.

As a way to start the collaboration in a concrete way we helped the community to create a web presence and an intranet for the association. The main objective was to increase their communication channels and engaged in a common project. The working group in charge considered that it was a subtle way to start encouraging members to use the Internet and computers more. We succeed in keeping the more ICT "fluent" members[1] and collaborators of the community informed and in providing a new channel for recruiting members and collaborators. However during the construction phase, the internal site never managed to draw the community. Though internal practices for sharing files and information where indeed rehearsed, this never turned into a functional community medium, since the face-to-face solutions always outperformed the experience of the intranet.

3.2 Sharing and collecting memories and knowledge

As a result of the design exercises with the sharing theme, a few ideas relating to sharing knowledge and memories were taken into focus and developed further in the community.

Figure 3. a) User Interface for sharing voice notes – Puhelaput. b) UI for sharing gardening and garden memories

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[1]   The internal area has served as a shared repository of official documents and resources, but it was used mainly by the board of directors of the Association; all of whom have had jobs and careers that required the use of computers to some extent.

For example, an audiovisual archive for creating and sharing gardening memories and a library of cooking recipes made out of video tips featuring active cookers of the community were explored. Similarly it was envisioned that communication and community awareness practices could be supported by tools like a platform for using voice messages to produce community news, organizing activities as well as private audio diaries. Sketches of these concepts and the prototypes can be seen in Figure 3.

It has been important to notice that even though only some portion of the ideas reach the demo or prototype stage, and some were simply not feasible to produce, some do continue a life of their own in the community and have been implemented using some other more straightforward means.

3.3 Coordinating everyday life

Since their plan was to take care of the maintenance tasks, cook and eat together once a day, an important theme for the community was how to take advantage of and develop ways to manage shared resources. The community developed a model of working groups for the residents of the building. Each working group (approximately 10 people) takes care of different tasks and has a "work" shift once in six weeks. During the working shift they take care of the planning and preparing of a common meal served Monday to Friday at five o'clock (except for the three summer months), as well as cleaning the house and managing the shared spaces. They also organize and produce different kind of social activities for themselves, there are active residents supporting hobby groups and organizing other activities.

Several other ideas related to coordinating and organizing emerged during the years, including a virtual library that could be physically distributed across their home bookshelves by including those titles that others could borrow, and a reminder system that could be used for the sauna or laundry turns.

A second stage of our collaboration continued later through a design research project[1] that gave the possibility of concretizing some of the earlier visions into implementable prototypes. The most developed prototype started with the idea of a "community calendar" (Lehtimäki & Rajanti 2007) that would help to how to organize and coordinate shared tasks of the community in a more distributed fashion. We will devote the next section to look at this experience in more detail.

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[1] This project was funded by the Finnish Funding Agency for Technology and Innovation (TEKES), and it was called "Emerging Digital Practices of Communities" (ADIK)

4 Sustaining the community.

Armed with their previous experiences on ideation workshops, and the wide variety of expertise in the community, the seniors brainstormed through their own working groups and in workshops with us, what a Loppukiri calendar should be. The system was meant to support some of the practices that the community would engage in once living under the same roof. Since the date of moving to the house was close, priority was given to: sharing, booking and using communal spaces; planning the common meal; and organizing and following up activities and offering neighbourly help. A design specification took shape and concluded in a very complete document, produced by the Active Seniors IT working group, describing the calendar and giving it a name: Miina (December 2005). Little by little, the calendar idea evolved into something the Seniors themselves call their Everyday Life Management System: a collection of web-based tools for the seniors which assists in the coordination and sharing of everyday life activities and information (Botero, Myller, Suzi, Kommonen 2007)

For design and production purposes the "system" was divided into several components: 1) the site - a framework for other components and common use cases (such as login and navigation); 2) Profile component to take care of the information of the members of the community; 3) A Dining Calendar - specialized in announcing joint dinners and registering for them; 4) A Shared Resources Calendar - with special features to reserve common shared resources and spaces such as laundry and sauna; 5) A General Group Event Calendar (Figure 3)- to share information with the community about general events; and 6) A Personal Calendar – Figure 4 presents one of the user interfaces, the view to the personal calendar.
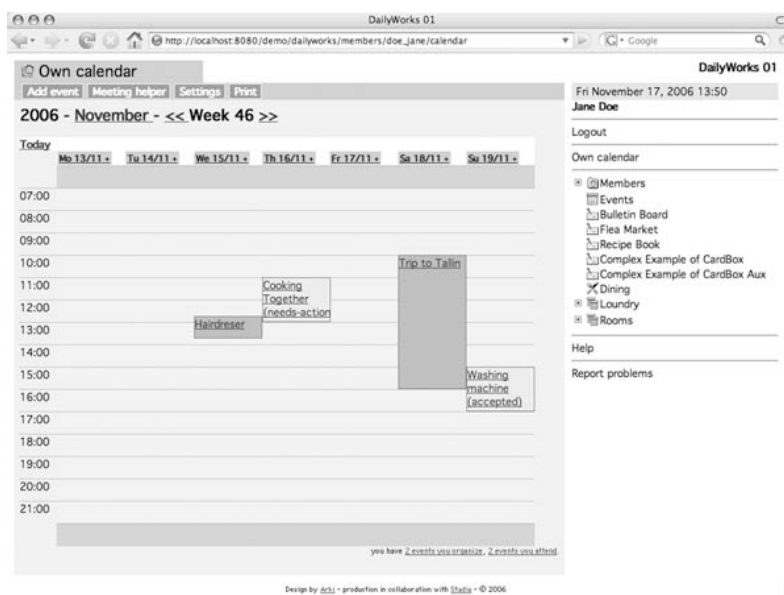

Figure 4. Detail of the main user interface of Miina (demo version)

The first iteration of the service was released in May 2006 at the same time they moved to the new house. The Active Seniors tested the system vigorously and started to take it into use slowly. They also planned strategies to help the rest of the community to use it. A team of volunteers started using the calendars for reservations and events, while a couple of the working groups used it to organize the common dinners. The rest of the community was using a parallel paper solution arrangement they also designed. The IT working group organized usability, or should we say "usefulness", testing and ideation meetings where they tried and analyzed how the different functionalities connected to their practical arrangements. The meetings produced detailed suggestions and changes to the rules and the behaviors available in the calendars and developed appropriate concepts to be used in the interface. Considerable amount of energy was spent on trying out alternatives for labels and concepts to use in the interface.

It was very interesting to se how the community felt complete ownership of and responsibility for this infrastructure; at that stage we were mostly following the deployment from outside (following the use as we had access to the system) and were available by email and participated in their meetings whenever we were invited. In the following we document certain issues that started to arise once actual use and the routines of everyday life shone more light on the role of Miina.

Announcing or planning?

While the calendar metaphor used during the concept design stage was an inspiring one, certain assumptions contained in it did not scale to actual practices that where already emerging in the house. This was evident with some features made to support the daily meal at Loppukiri. At the conceptual level the "common dining tool" emphasis seemed to be more on announcing dinners and registering for them. However the planning aspect was also crucial but not so well supported. For example, one of the community working groups had compiled a Loppukiri recipe book appropriate for the community. This was being used in its paper version for the cooking as well as for planning the weekly menu and shopping activities. It was also available for those wishing to join the dinner so that all could be aware of the ingredients of a meal (in case of allergies or other concerns). The initial specification and some concept description did include a sketch for the Recipe Book but it was left out from the first iteration. As soon as there was a chance, a Recipe Book component was implemented quickly, in a sketchy way, using the code from the Members Profile component and a new version of Miina with the "Recipe Book" component was rolled out, which improved the situation. Future versions of the system need to address the need of planning and taking decisions (e.g. what to cook, and whether to eat or not) with more flexibility, and a point of view of "media" (like the recipes).

Mixed access points:

A second aspect to develop further is the increasing need to connect and extend these types of solutions to multiple access points. Though much effort was spent in developing the calendars for managing the shared spaces, their use presented some challenges because not everybody was able to use them, or an interface to them did not exist in the actual space. When practices were fluctuating so much and our development resources were scarce, it was difficult to keep both the paper and digital versions of calendars updated.

We soon realized that it was better to postpone the uptake of the digital calendars and focus on the paper interfaces and to develop more the practice of delegating the maintenance of certain calendar functions to some "neighbor" willing to help. Expanding the connections to the paper interfaces is a crucial thing to develop, as well as finding solution for more sophisticated access management strategies that will allow neighbors to help and take actions on behalf of each other, when appropriate.

Though some workarounds already have been found by sharing passwords and accounts, we believe this is an area in which social media needs better solutions as the software infrastructures still have very straightforward ideas of ownership, groups and so forth that do not address the complex practices of multifaceted communities.

Sharing and evolving:

While living together in the house it became more evident to the Active seniors that they will have many uses for a component inside Miina for storing various notes and documents. After the Recipe Book became available, the Active Seniors asked if it was possible to use a "copy" of the Recipe Book component as a bulletin board; in that case we did not have time to implement one. On their own, and to make their point clear to us, the seniors tried a couple of workarounds to make the Recipe Book behave like a community "note board". They played with the titles of the recipes to get them to appear in different order (e.g. by adding numbers or other symbols before titles to manipulate their sorting, etc.) and "misused" it to fit their purposes. At first, this request did not appear to be of high priority, as they had plans to use other infrastructures like the Arabianranta community portal discussion boards. Nonetheless, it became evident that their use would have required them to maintain and follow more systems and have more passwords and user names to take care of, etc. Hence their Miina seemed to them the right location for such sharing of files and information.

To address that concern and to experiment with ideas of more generic infrastructures, we concentrated the remaining efforts into turning the Recipe Book into a component that could allow building of dynamic containers for information. The result was a new module for creating "information boards" that

could hold items (or cards) whose structure could be defined by the creator and refined. We noticed how the collective negotiation of the naming of concepts and the meaning of the words used to talk about their practices was significant in the community. Since words establish shared understanding about their goals and responsibilities, they were considered very important. The new module made it easy to try new things, with appropriate names, and dynamically "try them out". The appearance of the board could be changed directly by someone in the community if it did not work out (nobody understood what to do or it became messy after a while to manage) and new arrangements and concepts could be tried out at little cost by filling or editing a form. To help jumpstart the process we created the Recipe Book and two other examples of new information structures like notice boards and document storage places. Today Miina has close to 18 different types of "containers" for announcing things, documenting activities in the house and so forth.

5 Discussion and conclusions

There are many kinds of development initiatives to support the development of senior care technology, but this case suggests another point of view: what about community care? Should more effort be put into supporting the ability of communities such as the seniors to be actors and pursue their self-initiative creatively and efficiently? How can design contribute to this?

It is evident that in the Active Seniors' life project, there are direct references to ways in which technology plays a role in organizing elderly care. However from our point of view, the constellation of new practices that they were envisioning (cooking together, supporting neighbourly help, keeping active through community involvement), their organizational strategies (e.g. working groups) and the holistic scope present an interesting case to study what it takes to sustain a "caring" community and the type of tools that are required.

In a particular sense there is no outside "management", and neither specialized care services are provided; rather they emphasize a strong commitment to work for the construction of a viable community. For many community members, an important motivation to join the project has been to expand and enrich their knowledge-sharing activities. Another important theme is that of attending and keeping up with mental (specifically memories, personal recollections, reminders) as well as physical fragility. There is no doubt that to address this concern, shared routines and care commitments could be a way forward. There is plenty of room for novel approaches that allow and make it possible, for example, to document those commitments and perhaps make them accessible to all, while respecting privacy. Though our experiments, Miina included, are far from being perfect solutions, most community members have felt those ideas offer an important prospect to overcome some of the obstacles of living at home longer. Practical

coordination of activities means sharing and managing common resources in a way that both creates accountability and visibility of the common activities and ensures that the activities could be organized and kept alive. There is a lot of work involved in creating and maintaining these types of arrangements that are usually taken for granted or simply outsourced.

There is still much work to be done in finding the right interfaces for these types of social media, but we believe that more effort should be directed precisely towards finding the right type of abstraction level that will allow everyday practitioners to continue fine-tuning (designing) their tools in use. One example of an innovative approach of the seniors to bridge the gap between the not-yet-perfect "advanced technology" and the fulfillment of the requirements of daily life routines, operating as social practice designers, is the development of the paper interfaces for Miina. Such low-tech, extensible and flexible design systems open the ways for the whole community to try new things out and weight them against existing practices and tools since keeping track of 2 accounting systems is waste of resources.

We believe that this is an important goal to keep pursuing, as the task of the professional designer becomes increasingly to provide the appropriate "design" interfaces (or tools) for the users to continue developing their practices and systems through design-in-use (Henderson & Kyng 1991). We hope to continue research to understand the challenges involved in providing open-ended components, platforms, and toolkits that increase and support the design capabilities of the stakeholders themselves.

Our collaboration with the Active Seniors life project has offered an opportunity to explore how diverse design activities, at the practice level, can be conceptualized and realized. Throughout our collaboration, they acquired new design tools and envisioning capabilities and some implementation resources, and were able to include more digital ideas and solutions in their life project. Compared to a traditional client/service situation, we did not propose a "product" for them, but instead an experiment in expanding their capacity to act as designers with new tools and visions. However, eventually we did realize some of the resulting designs as a validation of their meaningfulness. We can say that the capacity of this community to envision and design novel digital systems and their corresponding novel practices did indeed increase, and that they were able to act as quite competent co-designers in the implementation of their systems. We also noted that in the evolution of their practices, open ended and more designable tools are needed, as these provide them with more flexibility to mobilize and realize a greater variety of configurations according to different purposes and circumstances.

6 Acknowledgements

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Towards Ambient Assisted Shared Living for the Elderly

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Abstract. As of today, the number of elderly people living alone in their homes and needing care taking is growing steadily in the whole western world. One state-of-the art approach is to enrich homes with a multitude of sensors and actuators, but the problem of loneliness is not sufficiently tackled.

In our vision, smart homes are enriched with sensors, but also audio-visual components such as cameras, microphones, and beamers that allow opening the boundaries of one single home to interact with remote relatives and friends intuitively, feeling almost physical presence while, of course, minding privacy and non-intrusiveness. To decrease loneliness, social activities like playing cards with one another or having dinner together are supported. Additionally, the sensory equipped home helps with everyday activities, such as finding reading glasses, heating control, or preventing accidents. Finally, the system also includes anomaly detection like emergencies based on home sensor information and computer aided reasoning. The novelty of the approach lies in including the relatives in the loop of support and – thus – avoids increased isolation usually fostered by a fully automated home. In this position paper, we describe the technical concept of the solution as well as the evaluation methodology.

1 Introduction

The number of elderly people living alone in their homes and needing care taking is growing within Europe and the whole western world. Providing smart homes to support every day activities of elderly people is targeted in many related IT

solutions and a necessary prerequisite to support living at home, but it often neglects the loneliness of the elderly which will only increase when being surrounded by a fully automated household.

Hence, the overall aim of our interdisciplinary work is to include elderly people into the lives of their relatives and friends possibly living abroad or far away and vice versa. Technology ranging from sensors to audio-visual input and output as well as a reliable (tele) communication should therefore be exploited and used to create an *Ambient Assisted Shared Living (AMASL) space*. Hereby, the impression of intuitive, almost physical presence of remote relatives and friends should evolve supported by non-intrusive technological solution which can be afforded by households with medium income. In this new field of research, the remaining challenging open research questions range from technical and economical feasibility evaluations and proposing new technologies (including privacy provisioning) to user acceptance and well-care studies.

The technological challenges result from the economic requirements to use low-cost and off-the-shelf multimedia equipment, like consumer cameras, easy-to-use input devices, and beamers but still providing the impression of directly interacting with remote relatives and friends. Hereby, *intuitive interfaces* and new, *high quality remote multimedia services* will be provided. Similar to being physically present, the system should make the remote relatives aware of important conditions of the household of the elderly person, like the current room temperature (important to estimate whether the elderly person feeling cold suffers because of malfunctioning of the heating or illness). The necessary *sensors should be non-intrusive up to "invisible"*, low-cost, robust, and energy-efficient. Together with anomaly detection services, the system will also be able to recognize emergency situations (e.g., a person has fallen and is lying on the floor). To *assure privacy*, the technical solution follows the design principle to keep sensor data local at the households and just send necessary status information to "third parties", like the communication network service provider. As cameras are commonly rated as intrusive technology, we will not use cameras for observing every day activities.

With respect to user acceptance and well-care studies, it is most important to develop a best fitting *evaluation method for assessing user acceptance and an improvement in well-being*. The proposed evaluation method relies on intensive testing carried out by a selected group of elderly test users who will use the *AMASL* installations for a couple of months. During this time, the test persons will be accompanied by the research team, periodically visited, and interrogated to answer the crucial questions about acceptance and (subjective) well-being. We will evaluate the general idea of ambient assisted shared living along the following use cases: (i) joint activities (like playing cards, having dinner together), (ii) remote help (like, helping to find out why there is a particular noise or smell in the house, why it is so cold in the house, or where the wallet or reading glasses are situated[1]), and (iii) emergency detection (like a person who has fallen down the stairs).

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[1] We assume that elderly persons are not as familiar with new technologies as their relatives are and therefore prefer to ask a trusted person rather than to interact with an automated smart home directly. However,

This position paper gives an overview of related work in Section 2, introduces the technical solution in Section 3, and discusses the setup of the field study in Section 4. We conclude this position paper with a summary and an outlook of work that is planned for the near future.

2 State of the Art

As the proposed concept for ambient assisted shared living is based on telecommunication-based solutions, smart home support, and ICT for elderly persons in general, we will summarize related work in these domains.

2.1 Telecommunication-based solutions to foster shared living

The Session Initiation Protocol (SIP) is an IP-based protocol meant for managing communication sessions between two parties (IETF RFC 3261). In the last years, SIP became very popular in the area of Voice-over-IP (VoIP), i.e., telephony over the Internet, but SIP can be used to manage sessions of any type, including VoIP, video conferences, gaming, CSCW, etc. SIP offers five categories of functions: (i) User location determines the current location or address where a caller can find the callee, (ii) user availability determines whether a callee is currently reachable, (iii) user capabilities, (iv) session setup is meant for determining and exchanging communication parameters that, e.g., describe the used codecs, and finally (v) session management for creating, adapting, and tearing down communication sessions. For exchanging data describing important properties of the session and session parameters, the Session Description Protocol (SDP), described in IETF RFC 4566, is used by SIP. It is important to note that neither SIP nor SDP themselves transport any media data. Once a session is established, the clients then may exchange media data either directly, or via proxies, here again using other protocols, e.g., the Real-Time Transport Protocol (RTP) for audio and video data or any non-standardized protocol designed by the application programmers (IETF RFC 3550).

As said, real-time data like speech or video usually is transported by RTP. Such continuous data requires a very smooth and regular transport by the network, and both sender and receiver are tightly synchronized. RTP is not suited well for discrete communication, where single events must be transported, like communicating that one user has just clicked on a button. For such cases, a set of protocols enabling so-called Web services fit much better. Web services have been defined by the World Wide Web Consortium (W3C, http://www.w3.org/) in order to support interoperable machine-to-machine interaction over IP networks. Web services are comparable to other approaches like the Common Object

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the system will be designed that way that elderly people will be also informed about the status of their household and can make use of this information.

Request Broker Architecture (CORBA) described by the OMG, or Remote Procedure Calls (RPC) described by Birrell and Nelson (1984). In contrast, they are based on techniques known from the World Wide Web. Similar to SIP, Web service protocols enable registering and finding services (Universal Description Discovery and Integration, UDDI), describing services (Web Service Description Language, WSDL), and finally calling services (Simple Object Access Protocol, SOAP). All of these protocols are based on XML (W3C, http://www.w3.org/).

For AMASL, a realistic visual presentation of each person is very important. Hereby, persons can be shown in several ways. The most basic way is to use a common TV set. Due its limited size and the fact that TV sets are often put at fixed locations in the living room, this is not an ideal solution. A similar approach would be to use a possibly large computer monitor. Since monitors are usually much cheaper than TV sets, several of them could be put into a household with affordable costs. However, similar to TV sets, monitors do not come in overly large sizes and thus they do not create a realistic impression of a shared living space. Another way of visualizing persons realistically is to use so-called Head-Mounted Displays (HMDs). These are like eyeglasses, but show the output of a computer instead. Unfortunately, HMDs are rather bulky and using them usually prevents people from seeing the real surrounding (so-called see-through HMDs are extremely expensive and often limited in their capabilities), and thus HMDs are not useful at all in the context of AMASL.

The best solution for visualizing other people and spaces seems to use off-the-shelf computer projectors. In the past there have been various research projects on how to use projectors for virtual reality human computer interaction, and e-learning (Cruz-Neira et al. 1992). Especially video wall displays have been used for many projects in the area of collaboration in working environments (Otto et al.). People are meant to stand next to such a display and interact with it, e.g., by moving virtual objects around. Interaction can be determined by touch-sensitive surfaces or through gesture recognition by video analysis. Because of the closeness, video wall displays must provide a high resolution, and shadows caused by front projectors present a problem. Therefore, video wall displays are usually built by an array of back-projected canvases. This way, no shadow is cast by people standing in front of the display, and the total resolution is the sum of the individual resolutions of the single projectors. On the other hand the costs and the need for space increase significantly. Alternative approaches use a projector that is mounted above the canvas.

In general, using projectors for creating an immersive presentation of real people is also problematic due to the strict 2D technology. However, technologies for 3D presentations in principle are available, always requiring that left and right eye of the observer receive different pictures. One technology for 3D displays is given by LCD shutter glasses, which must be worn by the users (Woligroski). The glasses must be synchronized with the display, usually an LCD monitor, which

sequentially shows images for the left and right eye, the other eye being blocked by the shutter glass. Another technology that is best suited for projectors is to send pictures for the left and right eye using orthogonal polarization. Again, users have to wear glasses, which have different polarization filters for left and right eye. Both approaches have drawbacks and are usually expensive when being used for projectors (e.g., require the use of two projectors), or require a high amount of skills to be realized (Bungert).

However it is known that when using only one eye (or ear), a pseudo-3D effect can be emulated by moving the head from left to right, i.e., an observer is able to construct 3D information from 3D information. By using head tracking this can be used for increasing the realism without a high overhead (Lee).

Human-Computer Interaction (HCI) can be done with various means, including dedicated input devices like the computer mouse, keyboard, etc. Additionally, wearing data gloves or video analysis allows to recognize gestures, here trying to make HCI more natural. However, gesture recognition demands learning gestures and requires a significant amount of concentration and skills, which make their use in AAL problematic. Recently the gaming industry has provided innovative HCI equipment to make HCI more realistic. This includes the Wii Remote (NINTENDO) and only recently the Project Natal launched (MICROSOFT) and Playstation Eye by (SONY). While the Wii works like a mixture between a 3D mouse and a TV remote control, both Project Natal and the Playstation Eye provide gesture recognition and face tracking through video analysis.

2.2 Smart home approaches

Living in the western world is increasingly assisted by a multitude of sensors and actuators enabling home service automation supported by local networks and available broadband access networks. International research projects focused on investigating new technologies for future smart homes are, e.g., AMBIENTE (Fraunhofer Institute: AMBIENTE), AMIGO (Amigo Project), inHaus (Fraunhofer Institute: inHaus), EasyLiving (Brumitt et al. 2000), AHRI (Georgia Institute of Technology), The PlaceLab (House_n), SmartHOME (Universität der Bundeswehr München), T-Com-Haus (T-COM), and MavHome (University of Texas at Arlington). These research projects demonstrate the international interest in technologies for future home environments, which are highly attractive to support in particular elderly people. Research is carried out to explore the technical feasibility of smart homes, but an increasing interest can be detected in usage and acceptance studies of these new technologies. For example, the living labs of the MIT project PlaceLab (House_n) investigate the behavior of test persons in longer time periods to derive realistic usage results. Our research for ambient assisted follows this line of research for elderly people to come up with realistic and helpful solutions in a field where these factors are not sufficiently clear yet.

The Fraunhofer IST project AMIGO proves that home automation products can be successfully developed for the market, but complex installations and missing interoperability or usage scenarios are inhibiting the breakthrough. A possible technical realization of smart living is usually implemented by integrating home automation technology based on interconnected sensor- and actuator technology, entertainment technology, and PCs (Technology Review 2007). For communication, Ethernet and wireless LAN is used to control heating and air conditioning, access to the house (e.g., using finger scans), alarming, novel displays integrated into furniture (like tables and walls) to display home status information of devices like the oven, washing machine, and air conditioning.

Smart living for elderly people and people needing care-taking envisions a step into new technology for better well-being and quality of live. Smart homes are envisioned to take away the burden of difficult every day activities which nowadays, e.g., often force people to leave their homes and change to an asylum for elderly people. The sensory equipped home should be able to detect important anomalies in the elderly person's behavior, such as, dehydration and collapses. By doing so, the medical risk of living at home can be minimized.

The AMASL project goes one step further to integrate relatives actively in such every day activities and to research, to which extend a telecommunication-based solution can integrate both smart home and communication for social inclusion (e.g., playing cards together), providing help for daily activities (e.g., controlling the heating), and assistance in cases of emergency while still providing privacy to a high degree.

2.3 ICT for elderly persons and their well care

Information and Communication Technology (ICT) characterizes today's society. Within the next few years, we will have to face an increased number of elderly people side by side with technological developments and it is not clear how to best use ICT for elderly persons.

The Norwegian Board of Technology has carried out investigations related to two major topics in this context. These topics are: (i) Use of ICT in the daily lives of the elderly persons, and (ii) Use of ICT in health care and welfare services for old people and people with dementia.

Hereby, it has to be noted that elderly people are a heterogeneous group. They have different needs for help, different capabilities, and different learning abilities. However, in many of these cases, smart home technology may be used for the benefit of the elderly persons as argued below:

(1) *Mastering the daily life*. For elderly people the use of smart home technology is expected to make them feel secure (e.g., warning in case of an oven overheating). ICT may aid elderly people to memorize things and,

thus, to master their own housing situation. As a consequence, it becomes possible to remain living at home for a longer time.

(2) *Increase social contact*. Social contact may be increased by user-friendly communication technology, including more human care from relatives, nurses and others. On the other hand, elderly people often have objections to ICT. Information and knowledge about ICT will be important to increase user acceptance (see, e.g., conference ICT for elderly people 2000).

In a study by Eggermont et al. (2006) based on dialogs with senior citizens about integrating ICT into their everyday living, some important results have been derived: The elderly would like to see that ICT enhances the quality of life. For instance, ICT may support the social relationships of the elderly and help them to fight loneliness. ICT may also enhance their physical condition and help them live independently. ICT may offer them possibilities to stay mobile, to relax, to learn and to work, in other words, to fully participate in society. Furthermore, senior citizens set two important conditions. First, new technology must be easily accessible to them, which requires that future ICT devices (and their developers) keep the typical physical limitations of the elderly in mind, as well as their lack of ICT related knowledge and skills. A second important demand with regard to future ICT applications is that they are reliable and safe and do not pose a threat to the privacy of senior citizens.

Because of age-related changes of potential test persons, multidisciplinary research on the technology-gerontology interface is important for better understanding how to adapt technology to the needs of older people and how to train the elderly to use technology (Oppenauer et al. 2007).

3 Technological Concept

The aim of the project is to provide a system for social interaction, communication, and remote help. Social isolation should be decreased by giving the impression that relatives, friends, or professionals are physically near, within the same physical space. This impression should be achieved by an audio/visual presentation, which on the one hand should be as realistic as possible, but on the other hand also affordable. Furthermore, the whole system should be simple to be used, since elderly people cannot be supposed to be able to master complex user interfaces.
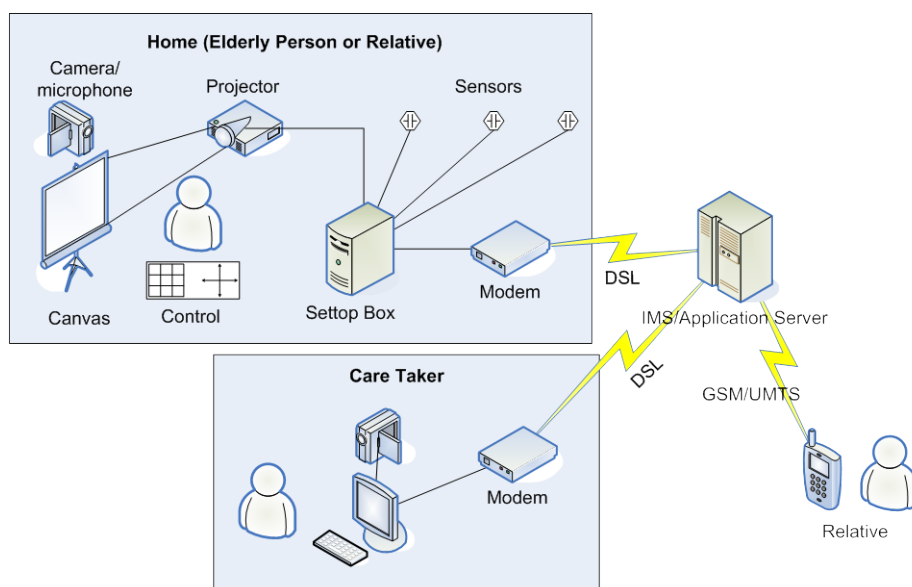
Figure 5: *AMASL* architecture.

The AMASL system architecture is shown in Figure 1. The audio/video equipment is built into the homes of elderly people and their relatives, who can be also mobile. The canvas and projector should be installed at a convenient place where people plan to spend time with their relatives and friends. The main component is the settop box, which is planned to be a off-the shelf computer, like a Mac Mini or Linux-based PC. Interaction is planned to be done in an intuitive way, currently we are focusing on the Wii Remote as a simple controller which is very similar to TV remote controls, something elderly people are likely to be used to. Currently it is not planned to add 3D capabilities, since this would increase the price of such a system significantly. However, we plan to apply face tracking by using the open source library OpenCV (Bradski and Kaehler 2008) and use it to emulate a kind of window into the home of the communication partner. We expect that this simple technique adds a considerable amount of realism to the presentation.

Homes are additionally equipped with sensors that measure the state of the home, track items or the inhabitants themselves. To be most convenient and useful, sensors should communicate using standard wireless networks (like ZigBee) and work energy-efficiently and long lasting. The main task of the sensors is to support communication and cooperation between people, enabling for instance relatives to help their parents remotely. Tracking of objects, e.g., the key, the reading glasses, or the TV remote control should make it possible to find such things that are regularly lost. Object tracking is done by attaching a low-power small ZigBee sender to an object which continuously sends a beacon signal to base stations situated in each room (Figure 2). Base stations near the sender read the signal and provide information about the signal strength to the home's settop

box. The settop box then computes an estimate for the object's position. We have carried out several experiments using equivalent BlueTooth sensors and neural networks that have been trained for estimating positions. Results indicate that under ideal conditions, a positioning accuracy down to 10 cm in theory is possible. In practice, especially if objects move and are attached to human bodies, an accuracy between 1 and 4 meters can be expected. Identifying the room in which the object is lying can be done with very high accuracy, however.
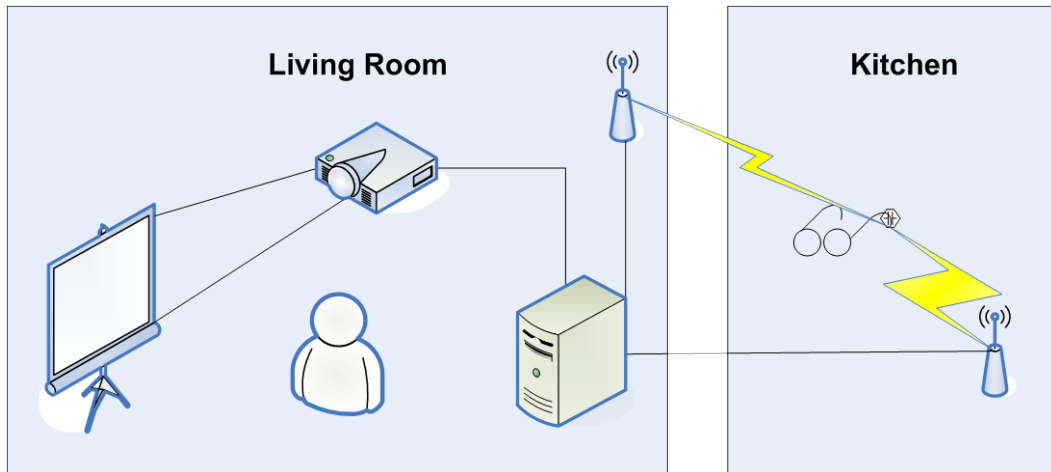

Figure 6: Object tracking using ZigBee senders attached to objects.

Additionally, relatives should be able to remotely check the states of the houses, like whether windows or doors are open, whether water is flowing, or whether the oven is on. Therefore, we will install appropriate contact detectors, movement monitors, temperature sensors, etc. Finally, sensors should also be used to detect emergency situations, i.e., situations where elderly people require help but are not able to call for help themselves. Basically, alarm detection can be done in two ways. First, sensors can record normal behavior of the inhabitants, and learn what is to be expected. Any behavior that is abnormal in some way can then, in principle, trigger an alarm. This approach requires some time for training what is normal. This system detects alarms implicitly and is likely not to trigger an alarm immediately after an accident has occurred. Sensors can also be used for detecting accidents explicitly, for instance by measuring the acceleration of an arm. In our project we will mainly focus on implicit accident detection, but also experiment with explicit detection using various sensor technologies. However, the sensors are not meant for direct surveillance, i.e., audio/video is only used for calls, but not for alarm detection. If no calls are going on, the inhabitants must have the guarantee that they are not recorded.
At the center of AMASL we will use the IP Multimedia Subsystem (IMS), which is a collection of IP-based protocols defining the core of the next generation

telecom networks, allowing telephony, video conferences, and general telecom services to be run in an all-IP packet switched network. IMS is currently standardized by the 3rd Generation Partnership Project (3GPP, http://www.3gpp.org/), an industrial forum in charge of all specifications of 3G-wireless communication. However, IMS can be used for wireline access networks as well, including ADSL or cable. Signaling in IMS is done using SIP, and requires from the client only little more information like authentication.

All Web service based applications are run on a central IMS application server. AMASL applications will include for instance card games, a digital photo album shared with friends and relatives, and presenting news, weather and health information. Other services that might be of interest for elderly people include for instance mental training, Karaoke, fitness training, ordering food or medicine, etc.

For remote help and alarms in AMASL it is planned to run all sensor inference algorithms locally inside the settop box, and only in case an alarm is triggered, aggregated information is sent to the application server.

Scientific challenges from the technological side include improving realistic communication at low cost, experimenting with innovative and intuitive HCI technologies, and machine learning and inference of sensor data that describe daily routines and, consequently, also detect anomalies, all in the special context of AAL.

4 Planned Field Study

To evaluate the presented solution, a methodologically advanced field study will be carried out. In contrast to short term test evaluations lasting up to a few hours followed by asking the test persons to fill in a questionnaire, we aim at an extended user study over a few months to derive in depth results about user acceptance and well-being. The main research questions that should be addressed are:

(1) How does the *ambient assisted shared living* system influence the social life of the elderly and their family?
(2) Is it possible to support social integration of the elderly person in the family using the *ambient assisted shared living* services, in particular the multimedia communication services?
(3) Is it possible to support the elderly person in daily life activities using the *ambient assisted shared living* system?

4.1 Study design

To answer the research questions in the planned field study, a case study design with a mixed method approach is chosen. Due to the small sample size and the

openness of the questions, the focus is set on qualitative methods. Quantitative evaluations will be added where they are appropriate.

Case study design

The case study design involves an intensive exploration of a single unit of study, such as a person, family, group, community, or institution or a very small number of subjects who are examined intensively. Although the number of subjects tends to be small, the number of variables involved is usually large. In fact, it is important to examine all variables that might have an impact on the situation being studied (Burns, Grove 2005).
In a case study, the case itself is central to the researcher. The focus of case studies is typically on determining the dynamics of why the individual thinks, behaves, or develops in a particular manner. Data are often collected that relate not only to the person's present state but also to past experiences and situational and environmental factors relevant to the problem being examined (Polit, Hugler 1999). The greatest advantage of case studies is the investigation depth that is possible when a limited number of individuals are being investigated.

The study methods

The methods used in the field of this study to answer the research questions are both of qualitative and quantitative kind, where the focus is set on qualitative methods. Among the qualitative methods available, the following, selected methods will be used: notes of qualitative observations, in-depth interviews, and narrative documents such as diary.
The aim of any qualitative research data collection tool is to explore the "insider perspective" (Taylor 2005). For quantitative investigation, structured interviews will be used (e.g. questioner for social isolation, evaluation of impairments).

Ethical issues

Ethical issues have to be addressed to base the study on serious ground and to enable a trust-relationship between the test users and investigating researchers. From an ethical perspective, the following issues have to be addressed:

(1) *Informed consent.* To avoid harming participants in a study it is essential to gain their agreed consent to taking part (Iphofen 2005). The participants in this study are fully informed about the study purpose, participant status, sponsorship, procedures, type of data, participant selection, their right to withdraw, and contact information. The researcher presents a summary of essential information in a short form orally and the full information in

writing as well. The researcher documents the informed consent process by having participants sign a consent form.

(2) *Right to privacy and anonymity.* All research with humans constitutes some type of intrusion into the people's personal lives. Researchers need to ensure that their research is not more intrusive than it needs to be and that the participant's privacy is maintained throughout the study (Polit, Hungler 1999). To safeguard the confidentiality of participants, the researchers in this study implement following steps:

- The research information will not be shared with strangers or with family members. Identifying participant information (name, address) will only be obtained when it is essential.
- The access to identifying information is restricted to the researcher.
- Identity related information is not entered to computer files.
- Identity related information is destroyed as soon as possible.
- Because of the small number of respondents and the rich descriptive information it is essential to protect the identities of the participants adequately (Polit, Hungler 1999).

(3) *External review.* Before the proposed research plan and procedures are implemented, the ethical dimensions were subjected to external review. The highlighted issues of the ethical report are implemented in the procedures of the project and some are pointed out in the following conclusion. At first, it has to be insured that all information for the participants are given in a clear and concise way. Furthermore, the researchers in the planned field study have to prove that the application causes no risk of injury (e.g. risk of falls through cable). The project leaders have to define the liability and the participants have to be informed. Moreover, the potential test users must have the ability to express consent to attend the research project. Nevertheless, the researchers have to ensure the protection of data privacy.

4.2 On selecting test users

For this project, one of the challenges is to find a suitable set of persons willing to participate in the study. A first step is the development of a profile description of the potential test users and a second step is the advertisement and selection of participants. In particular when working with elderly people, experiences in other projects have shown that a trust-relationship is very important for a successful selection and satisfactory participation in such a study. As a consequence, we will establish the contact between the accompanying researcher and the elderly participant in early stages of the selection process.

The critical first step in qualitative sampling is the selection of a setting with high potential for information richness. Hereby, the key in qualitative studies is to extract the greatest possible information from the few cases. The profile description of the persons (elderly and relatives) contains (i) age, (ii) physical and cognitive abilities (e.g., we will focus on test users experiencing some impairments to move easily out of the house), (iii) living facility (including technology available), and (iv) the fact that they live alone.

In the second step so far, we used the possibility to advert the research project in one of the project's partner's (Red Cross, one of the biggest NPOs in Austria) newspaper and journals for elderly people to attract suitable candidates, as well as contacts to forums of elderly people. To give an impression of the responsiveness of the people, we can only present preliminary numbers. The customer's response regarding to the newspaper article was an amount of nine elderly people within approx. two months who showed interest in participation. Interested persons were in general female and in average 80 years old. Most of them suffer of chronic diseases which complicates leaving their homes. The request they share all together is, that they want to have more and easier contact to their family.

5   Conclusions and Future Work

In this position paper, we described the requirements, the design, and the evaluation methodology of an ambient assisted shared living space. The approach aims at using sensory and multimedia communication technology to include elderly people into the homes of their relatives and friends. While the sensory equipment should be non-intrusive and nearly invisible, the multimedia communication equipment should provide high quality and intuitive user interfaces. The technical solution therefore includes sensors for in-door object location tracking and sensing of important states of the house (e.g., heating, closing status of doors and windows). The multimedia I/O system includes components such as cameras, microphones, and beamers. First prototypical implementations have been carried out using the Wii Remote for intuitive user interactions. For providing the telecommunication infrastructure, the IP Multimedia Subsystem (IMS) is currently evaluated.

The approach is followed in a recent interdisciplinary research project termed AMASL which will answer research questions about the feasibility and usefulness of the envisioned technological solution along three classes of applications: (i) supporting social contacts, (ii) helping with daily routines, and (iii) emergency detection. In all use cases, the inclusion of relatives and friends is supported. In future work, we will provide prototypes and, finally, the results of the field study planned.

Acknowledgments.

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Wii play with elderly people

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Abstract. In this paper we report the experiences we had while elderly people in a residential home interacted with the *wii*, a game console offering haptic modes of interaction. While the haptic mode of interaction offers many opportunities for health related activities, we faced hindrances when introducing the *wii* to people who were skeptical about the usage of video games. We also faced problems when playing *wii* related to physical and / or coordination issues, such as problems in pressing or releasing buttons in the correct moment or being confused by menus opening accidently when false buttons were pressed. To deal with these problems, we developed modifications of the setting and the devices used.

1 Introduction

In the last several years video games came into our daily life and gained a lot of attention, and the amount of people playing video games is increasing very fast [2]. When talking about video games there is a stereotype about children sitting at home and playing by themselves. However, video games are more and more often used in multiplayer settings both online in distributed settings [7] and offline in the same place [8]. Video games developed a social component and have the ability to bring people together. Recently, there have been success stories in newspapers and journals, reporting about the use of *wii* consoles in retirement homes as an example. Those groups were mostly organized by two university students who started a *wii* bowling league for elderly [1]. For their project they traveled to residential homes all over Germany and organized *wii* bowling events. The scores of the participants were summed for each retirement home, by this calculation they determined the best retirement home which got a little award.
In the search for new methods of interacting with multimedia systems for elderly we started our own *wii* project in a residential home in Germany. In contrast to the studies of the two students we tried to understand the social perspective of playing *wii* with the elderly.

We wanted to investigate the two following topics and the related interaction with the *wii* with the elderly. The caregivers were mostly interested in the usage of the *wii* as a therapeutic device encouraging the elderly to be more active.

Additionally, we were interested in the social impact the organization of *wii* events would have to the elderly living in the retirement home. Especially to those who take part in the *wii* events but even to the related persons like staff and volunteers. We tried to find out what social impact the cooperative gameplay with the *wii* would have for the elderly. Based on this we wanted to gather knowledge about the usability of the *wii* in elderly environments in order to develop implications for design for new systems supporting social communities among elderly.

In order to get knowledge about the usability of the *wii* in these special use conditions we were interested in new ways of interacting with multimedia systems not specifically designed for the elderly. The *wii* input system is often described as intentional and easy to use so we were interested in seeing elderly using the *wiimote*, the original controller of the *wii* console. The *wiimote* has some buttons which are used for input. Additionally, it can be used as a pointing device, and it is able to track motion. This combination could be used to combine pointing and gesture input for new social media systems.

In the following we will first represent the related research before we will describe the setting and participants. Afterwards we describe the underlying methodological approach and we will then illustrate the problems we had and the solutions we developed before we come to a final discussion and conclusion.

2 Related Research

There has already been some research done on the potential that video games might have for the physical and or mental education of people [9, 11]. In research of cooperative gaming there has been some reporting on social effects computer games played online [10, 12] or even offline [8] could have. Even gender specific topics [13] were taken into account when researching effects of video game playing.

There have only been few studies focusing on elderly people [14]. Although much of the well founded research on implications for game design for elderly has been done. A major outcome in addition to the design related results were the benefits the elderly could gain by playing video games [15, 16]. The main stated benefits were in training the physical and mental capabilities successfully. This points out that from former studies we have hints that we should be able to train those capabilities with the *wii* as well.

The *wiimote*, the controller of the *wii* offers different ways of input we became actually interested in the interaction between the elderly and the video game. When moving towards new ways of input for the elderly we can find critical research on touch panel based input for the elderly [17] which gives implications for design towards usability for the elderly people. It shows that current interfaces as they are currently designed are not the first choice when designing input

capabilities for the elderly. By using the *wiimote* we introduced a new device which differed from the devices which were there had already been research on by offering the different ways of input.

When looking at research that was actually done with the *wii* and *wii*mote device we find that most frequent the outcome was that the *wii* is easy to use and quickly adopted by the elderly [18]. In her thesis Groveman [21] used the *wii* and built some software to track motions of elderly people. Although there is already a lot of studies in the different fields there have been no studies on the usage of the *wii* system as it is used by the elderly.

3   Setting & Participants

For the study we selected a German retirement home we already had contacts with, from other projects. The retirement home offers different programs for the elderly living in the home each day, the exercises are diverse from small sport exercises to doing little brainteasers to learning new languages. The retirement home provided us with a large screen television for the *wii* session which was ideal for playing *wii* with the participants. During every session there was at least one professional caregiver present who supported the elderly when needed. The settings were open which means that at any moment people could join or leave the group freely.

When taking the definition of health as *"[…] a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"*[6] we have to report the fact that we realized many of the elderly had very few social contacts since moving to in the retirement home. In our interviews we got many insights into the daily life of the elderly in this retirement home and noticed that some of them would like more social programs to be offered but would not try to organize social events by themselves. By organizing the *wii* events we tried to find out more about this phenomenon which differs from the situation seen in other European countries where they come to retirement homes in order to join the community [20].

When describing further details of the setting and the participants we have to describe two different types of settings. The introduction event where we first presented the *wii* to the elderly and the five following *wii* events we held in the retirement home once a month.

3.1   Tryout

In order to prepare the *wii* events in the retirement home we decided to introduce the *wii* during a regular fitness exercise. We asked the course leader, a female volunteer worker, for permission to introduce the *wii* in her event. We explained that our aim was to offer a new group not affecting her fitness exercise program.

The day before the first event we tried out the *wii* with the responsible caregiver and the leader of the retirement home in order to get them familiar with the usage and the gameplay. We played for about one hour trying out different games and

discussed if the elderly would be able to do the games. We also tried out the *wii-fit-balance-board*, a *wii* controller board with pressure sensors in it, which are used for controlling the games standing on the board. It is usually used to train your balance and reaction.

We decided in this session that we would not use this during the first phase because most of the elderly had physical problems which resulted in limited capabilities of balance. The capabilities were seen as not trainable with the balance-board by the care giving personnel taking part in the tryout.

3.2 First Presentation

During the first introduction we presented the *wii* to 18 elderly persons, mostly female (only three male practitioners) living in the retirement home. The elderly taking part in this event were all residents of the retirement home and members of the fitness program usually offered in this timeslot and were at least able to do basic coordinated movements, a fact we considered important.

The event took place in the big dining room which was also used for the program between the meal times. The room was quite big so the elderly taking part in this event could get seated in a U-shape where the television was placed to the open side of the U. The elderly were sitting on chairs or in their wheelchairs. We selected *wii* sports bowling in single player mode as the game so we had only one person playing at the same time. We put a chair in the middle of the U which was taken by the person who was playing with the *wii* if not sitting in a wheelchair. This setting implicated that the elderly had to interact with others when passing the controller which was as intended.

3.3 Following Wii Events

For the following *wii* events we invited six participants, five interested elderly from the first event and one elderly which was interested but could not take part in the first event because he was not living in the retirement home. The participants were selected based on their motivation and capabilities by the responsible caregiver. When selecting he tried to get a group of different people. Beginning with the third regular event we had an additional participant who moved to the retirement home some days before this third event. In those events we had about one third male participants and two third female participants. The physical and mental conditions of the participants were very different.

During the events we mostly played *wii* sports bowling, with some small breaks where we played *wii* sport boxing during the first two events.

Different from the first event we moved to a smaller room with the group for all of the following events, which was helpful as the following groups had fewer members. By moving to a smaller room the elderly could talk to each other and everyone could see the screen.

4 Method

We conducted a qualitative study with a limited number of participants. The empirical research was documented by field protocols taken during each of the six sessions and by total of six semi structured interviews of about one hour we took with the elderly and caregivers involved in the event. The interviews took place at different times during the study. The first time we did interviews with some of the elderly living in the elderly home before starting the *wii* events then during the *wii* events we did interviews with the same elderly people we had asked in the first interviews and additional elderly people who participated in the groups. In addition there was an evaluation meeting with the leading caregiver after each session in which we discussed the event, with focus on expectations, problems and solutions. Based on the results of this discussion we planned the next event.

In our observation we focused on aspects of interaction with the device and other elderly people. In the interviews we focused more on the experiences the elderly had when interacting with the *wii* and what problems they faced when playing the games.

We had the aim to recruit five to ten interested elderly from the first event, convinced that the volunteer group leader of the fitness event would willingly help us to recruit the elderly.

For the following events we expected improvements regarding the coordination and movements of the elderly and an increasing fun factor provided by the game.

5 Observations & Problems

Our expectations for the first event were simple and naive in the same moment. Based on the related work and on some positive articles [1] published in different German newspapers we were convinced of the fact that playing *wii* was very easy and intuitive and no problem for elderly people. During our test session we got familiar with the handling of the *wii* very quickly and could hardly imagine the problems we would face the next day. We were convinced by the fact that many elderly had played skittles, which has many parallels to bowling, in their past and was quite popular in former times in Germany. We decided to play bowling with the elderly more so because it was promoted, as the easiest from the movements and most fun, by the other projects we mentioned before.

During the first session we observed that the attitude towards the *wii* changed from skepticism to curiosity. At the beginning of the session all the elderly were very skeptical about playing with video games. *"I know this thing, my grandchildren are playing with it"*, one woman said. But when we explained the *wii* and started to play the picture changed. The elderly were getting more and more engrossed in the match. They supported each other and those who already had some success in playing the game gave hints to those elderly who had problems using the controller. This was an expected result as it was seen before in other studies on group console game playing [2] before. We could even observe

that of the some elderly in the event which could see the others trying out the *wii* already started to exercise the movement before it was their turn.

We were confronted with an unexpected situation: When half the participants tried out the *wii*, the volunteer group leader started talking to some of the elderly trying to convince them that playing *wii* was wrong and that the elderly should not participate. When she noticed that most of the elderly were happy with playing *wii* and lost their concerns about the games demographics, which could be seen by the enjoyment of the game and heard as they started talking to the others about the fun they were having. She tried to change the event by starting an alternative program with singing and gymnastics at the same time. This made it more difficult for us to get the attention of the elderly, because they were swamped by all the different activities happening around them. Most of the elderly joined the alternative program as long as it was not their turn on the *wii*. It turned out after the *wii* event that the volunteer had concerns about her fitness event.

When trying the *wii* out the day before we played the game while standing in the room we also tried to play sitting on a chair and had no problems with the game. When introducing the *wii* to the elderly during the event we noticed that most of the elderly felt insecure when standing and preferred to sit on a chair. Some of the elderly lacked a choice as they used a wheelchair. We observed that for the elderly it was more difficult to play the game when sitting on a chair. The armrests especially were a barrier and made the movement difficult. This was mainly caused by the needed sequence of movement which was needed to play the game. First you have to press and hold down a button while you hold the controller in front of you with an extended arm. Then you have to move your extended arm backwards that it reaches about 45° and quickly move it forward again. When the arm reaches about 45° in front of your body you have to release the button.

Our expectation that many participants had played skittles before turned out to be wrong. We only had one woman joining the event who had played skittles before and only this woman criticized the game because of the unusual movements needed. The other participants could not compare the game to their past experiences and did not complain about the necessary movements. During the following events the selected participants improved their coordination and movement capabilities. This fact was underlined by the difference in the skills compared to a new participant who joined the group in the third event and faced the similar problems when first using the *wii* as the others did before.

The bowling game was difficult to play and needed much attention from the participants. To throw the virtual bowling ball you have to press a button, do a throw-like movement with your arm and release the button in the right moment with this simple process we had different problems. The first problem was that the controller had many buttons which were not needed during the game but interrupted the normal sequence and opened up some menus. When something unexpected happened the elderly were afraid that they destroyed the video game. In this situation it was very unclear for the elderly that they had to press the button which was displayed on the screen in order to continue. It sometimes took a long time to explain to them that they could not destroy the game and what effect the buttons had. The other problem was that the right moment when you have to release the button is very short. This requires a high level of attention from the

elderly. But here we faced another problem: we noticed that our explanations in combination with the hints from the other elderly and the massive in-game sound created stress for the participants which resulted in less fun and more difficulties when playing the game.

6 Discussion

During our events we often noticed how important it is to explain what our intentions were with the *wii* event. For future projects we learned that convincing all the involved people is very important in order to prevent future problems. Although we talked to the volunteer doing the fitness exercises with the elderly before presenting the *wii* and made it clear that we were planing an additional program not affecting her activity she was convinced that we were trying to substitute her with a video game. After the first round the caregiver who joined the round explained that the woman was always afraid of losing her groups for different reasons. It turned out that she did not like video games at all and that she inferred from the name *wii* sports bowling that we try to offer a sport program to the elderly which could substitute her program. After explaining our intentions another time and telling her that it was only about presenting the device and that we already had a new timeslot for the *wii* events she ended up in believing that there would be no elderly people joining this group. It is not always possible to convince all the people involved in a project but it is very helpful if the people are in favor of and try to support the project.
We noticed this fact another time when the leading caregiver was on holiday and another caregiver who was not fully convinced of the *wii* acted as deputy and joined the event. The way of interacting with the elderly and the way of trying to help them was much less effective than it was when the other caregiver did. The caregiver gave up explaining the movements to the elderly very quick when the elderly did not succeed in doing the movements.

In order to solve the problems encountered while playing the game we did several modifications over time. The first modification was to use chairs without armrests. This was a great improvement giving the elderly enough freedom of movement to play the game. By retaining the chairs we could give them the ability to sit securely and move freely the same time.
As a second modification we covered the unneeded buttons of the controller with carton so they could not be pressed accidentally any more. We could by this method moderate the level of confusion and increase the fun provided by playing the game. It turned out that the elderly even noticed the fact that we were trying to make the game easier, did not complain about this fact, and liked the new controller.
To moderate the stress we turned down the volume of the television device and tried to talk to the elderly more calmly. As we noticed that bowling needed a high level of attention from the participants we tried to relax a bit by changing the

game to boxing which did not need such a high level of coordination but needs a higher level of physical activity.

The moment when the button must be released is quite short we noticed that most of the elderly released the button too late, so we started explaining the sequence more precisely and helped the elderly by pressing and releasing the button while they did the throwing movement. This worked well but was only intended as intermediate solution. We accidentally discovered that when we had to describe the order of the needed actions in a different way in order to get better results. We started explaining that the button must be released more early as really needed, so actually we changed the order of the throwing movement and the release of the button. By this method we could explain the sequence in a way that the elderly could easily perform.

We noticed that when we did something wrong while trying to show the elderly how to do the movement correctly it was very useful because it showed the elderly that even we cannot perform the movement correctly every time.

We regarded the fact that many elderly in Germany used to play skittles in their past as very important for playing *wii* bowling with elderly. It turned out to be a good fact that actually we had only one woman who had played skittles before. Even though we often are locked in the assumption that playing *wii* bowling is intuitive because we do natural movements we suddenly noticed that the moments were not intuitive at all. They turned to be out to be easy to learn for people who had never done any similar thing before but the women who tried to do the "natural" skittles movements instead of the "artificial" game moments had a much longer way of learning the game.

Beside of the several problems we realized we got many interesting data about the social interaction within the group. As already mentioned the participants of the group were selected by the management of the retirement home from the group of interested people after the first event. The management tried to select participants which were able to understand the explanations and able to coordinate their movements. They did not group themselves so the community was artificial and they had no interaction during the first round at all. During the rounds the picture changed as the participants started to come to the event together and spoke to each other during the events. This was best illustrated by two women who were talking more and more about the game and other topics about their daily life since the second event. They were even more involved in helping when the new people joined the group. One woman told me that they sometimes started talking during lunch about the *wii* and that they were always looking forward to the next event.

7 Conclusion

In contrast to other studies about video games and elderly like [2] we have evidence that playing video games, such as *wii* bowling is not as easy as often asserted. We could see that how long it takes till the elderly can handle the game and have fun instead of throwbacks mainly depends on the mental and physical situation of the elderly. The danger of overstraining the elderly is heavily present

and we had to be very careful. When promoting video games for the elderly we have to ask us what benefit the games bring to their lives.

In our study we found that the *wii* actually can help improving the coordination capabilities and encourage people to move their arms. We could track a development in the capabilities of the elderly from event to event. This extends the knowledge we already got about the *wii* as device for physical exercises towards the elderly.

We found the *wii*mote is not as intentional as an input device when used by elderly as expected and see in other studies on the *wii*mote before. We had to do some modifications with the controller and had to provide much action space till the elderly were able to use it. We saw that it was not clear that a button must be pressed when it is shown on the screen. On the other hand the pointing functionality was quickly understood and used. For further input devices for elderly we think that the possibility to modify the device (e.g. disabling buttons) is a very important feature. Movement and pointing can be used by elderly as input but it must meet the physical conditions and capabilities of the elderly. In order to do so complex sequences and exact pointing should be avoided instead a kind of magnetic buttons attracting the cursor when near could be helpful.

We could observe how the community developed during the time. We have seen many similarities to cooperative gaming studies done with adults or child. But we always have to be aware of the fact that in the other studies the community in most cases was already there before playing. In our case the community developed while playing and could break down as fast as it developed when the events will end. As the management of the retirement home realized this problem they think about buying a *wii* and empower the elderly to self organize additional *wii* events.

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Enhancing Interaction Spaces by Social Media for the Elderly: A Workshop Report

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Ageing in communal place: Ethnographic studies of social interaction in senior housing communities

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Stinne Aaløkke Ballegaard, Ethnographer, PhD student. Stinne's main research interests are the role of health IT in the home, the collaboration between hospital and home, and performance of self-care in the home.

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Simon Bo Larsen, PhD. Simon's research interests within pervasive healthcare include telemedicine, CSCW, software architecture, and user driven innovation.

Aspects of social media design and innovation in a project for aging together

Andrea Botero: Is a Doctor of Arts candidate in Media Lab of the University of Art and Design Helsinki (TAIK). With a background in product design and new media Andrea works as designer and researcher in the arki research group at the same university.

Kari-Hans Kommonen is the director of the Arki research group in the Media Lab of the Aalto University School of Art and Design, Finland. The Arki group studies how everyday life is changing as it becomes more digital, and explores how digital technology and software can be designed to better serve and support people in realizing their own interests.

Towards Ambient Assisted Shared Living for the Elderly

Dr. Karin Anna Hummel is a University assistant at the Department of Distributed and Multimedia Systems, University of Vienna, performing research and teaching on mobile computing and mobile networking. She received her Doctoral degree (summa cum laude) from the Vienna University of Technology in 2005. Before starting to work in academia, she was working as a software engineer, project manager, and trainer for five years at Siemens AG, Austria. Current projects address data dissemination in mobile scenarios, mobility-aware overlays for wireless mesh networks, and shared ambient assisted living.

Prof. Helmut Hlavacs received his masters degree (1993) and his PhD (2000) from the Technical University of Vienna in the area of mathematics. Since October 2004, he has been associate professor at the Institute of Distributed and Multimedia Systems of the University of Vienna. His research interests include gaming, multimedia communication, energy efficiency of distributed systems, ambient assisted living, mobile computing, and quality of experience of networked services. Prof. Hlavacs is the author of one textbook, and numerous publications presented at international conferences and in journals.

Mag. Anneliese Lilgenau: I studied nursing sciences at the University of Vienna and I am a PhD student at the department of nursing sciences at the University of Vienna. Currently, I am working at the AMASL project as a research associate. Before starting my Master Study in Nursing Sciences I worked as a staff nurse in different departments at the hospital. After my masters degree I lectured Advanced

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V. - Prof. Mag. Dr. Hanna Mayer: I am a Certified Nurse and an Education- and Nursing Scientist. Since 2007 I am Head of the Department of Nursing Science at the University of Vienna and Deputy Director of the Studies Program. I am Lecturer of Nursing Science/Research at various Universities and university-based programmes for nursing scientists and teachers and managers in health care, an Author of various textbooks to the topic "nursing research" and "research methods". Main topics: Development of Nursing Science in Austria, Development of Curricula in Nursing (science), Research Methodology, Caring.

Verena Moser-Siegmeth is currently working at the Research Institute of the International Red Cross in Vienna. She graduated form the University of Vienna in 2007 having achieved a Bachelor of Science Degree in Sociology. Her doctoral thesis titled „The Geriatric Population in Europe. Structural problems with their care" is due to be completed this year. Before entering university, she spent fourteen years as a nurse specialist in the Accident and Emergency Department of the Vienna General Hospital.

Wii play with elderly people

Dipl.-Wirt. Inform. Cornelius Neufeldt is a research assistant in the research group "Information Systems and New Media" and PhD candidate at the Graduate School "Locating Media/Situierte Medien", both at University of Siegen. He has a background in information science and management and his research interests are ubiquitous computing, ICT in domestic and mobile environments and interactive TV applications. He currently works in the field of social TV based applications for elderly and EUD aspects of social TV applications.