Building a Mutual Assistance Living Community for Elderly People

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ABSTRACT

The population of elderly people is increasing rapidly, which becomes a predominant aspect of our societies. As such, solutions both efficacious and cost-effective need to be sought to provide services required by an ever increasing number of users. Ambient Assisted Living (AAL) is a new approach which promises to address the needs of elderly people. Ambient Intelligence technologies are widely developed in this domain aiming to construct safe environments around assisted peoples and help them maintain independent living. However, there are still many fundamental issues in AAL that remain open. Most of the current efforts still do not fully express the power of the human being, while the importance of social connections and social activities is less noticed. Our conjecture is that such features are fundamental prerequisites towards truly effective AAL services.

In this chapter, we firstly review the current status of researches on AAL, discuss the promises and possible benefits , while also indicating the challenges we must meet in order to develop practical and efficient AAL systems for elderly people. Afterwards we propose an approach to construct effective home-care systems for elderly people. We use service oriented architecture (SOA) to orchestrate the available resources inside the community, organizing services from both human side and assistive devices.

Such a “mutual assistance community” can also serve as a platform to introduce intergenerational activities. The younger generation could help the elder generation on physical challenging tasks, while the elderly people could also provide their valuable experience in problem solving, which may greatly assist the younger ones at work, in study, etc. In so doing, social connections and inclusion are enhanced, generation gaps are narrowed, and the elderly people may find new stimuli to live more active lives, while societal resources may be utilized more efficiently and more effectively.

Our researches are laying out the foundation to build up a mutual assistance community to assist the elderly people aging well. We have taken thorough analysis and perspective over such a community. We have sketched a clear vision of building the community. The needed technologies have been investigated, challenges of building such a community have been reviewed, some prototypic solutions have been designed, and preliminary researches on organizing services inside the community have been done. The next step of our research is to call for wide collaborations from industrial, academic and governmental bodies to bring this proposed mutual assistance community into actual implementation.

INTRODUCTION

A well known trend and a predominant aspect of our societies is the rapid increase of the elderly population. Several statistical reports revealed that the proportion of elderly people keeps increasing since the end of last century, e.g. EUROSTAT (EUROSTAT, 2004) indicated that "the share of the total European population (EU 15) older than 65 is set to increase from 16.3% in 2000 to 22% by 2025 and 27.5% by 2050." The European overview report of Ambient Assisted Living (AAL) investigated this trend (Steg et al., 2006). Several research programmes that focus on AAL have been started, such as the Ambient Assisted Living Joint Programme launched by the European Union in 2008, which aims to find out an efficient solution to help elderly people independently living.

Independent living is indeed regarded as a key requisite of AAL services. Studies of Counsel and Care in UK found out that elderly people would prefer to live in their own home rather than in nursing houses, thus they need support to remain independent at their home (Counsel and Care, 2005). Researches also proved that remote clinical therapy at home will not bring negative effect to the therapy process (Deutsch, Lewis & Burdea, 2007). However, one significant characteristic for the elderly and disabled people is the reduction of their mobility and social contact. The reduction of mobility also makes simple tasks, like feeding a pet or mowing the grass in the garden, more difficulty to realize. In order to improve the quality of life for the elderly people, it is important to guarantee that assistance to those people be timely arranged in case of need.

AAL aims at extending the time that elderly people can live in their home environment by increasing their autonomy and assisting them in carrying out daily life activities by the use of intelligent products and the provision of remote services including care services. Most efforts towards building ambient assisted living systems for the elderly people are based on developing pervasive devices and use Ambient Intelligence to integrate these devices together to construct a safety environment. Ambient intelligence refers to electronic systems that provide services in a sensitive and responsive way to the presences of people, and unobtrusively integrated into our daily environment (Aarts, Harwig, & Schuurmans, 2001). Living assistance systems and assistive devices are thus developed to facilitate the daily lives of the elderly people. These technologies promised to help the elderly people living independently in comfortable ways. However, their limitation is that these efforts still do not fully express the power of human being, and the importance of social connections and social activities is less noticed. Although such efforts are close to achieve the goal of assisting the elderly people live independently by transferring the dependence from human side to assistive devices, we observe how such transfer also reduces the social connections of the assisted people.

In this chapter, we take a broader view on AAL. We reckon the promise that the home assistance systems developed using Ambient Intelligence could bring a safety environment around the elderly people. However, we also argue that the current solution overemphasized the importance of smart devices while either neglecting or lacking of real implementations on the side of human interaction and exploitation of human power. We will suggest combining the machinery power from assistive devices and the human power from social computing, seamlessly integrated together, so as to timely provide needed services, and effectively utilize the social resources. This means not only to focus on keeping elderly people physically healthy, but also to take their other daily requirements into consideration and best improve their quality of lives.

In the next sections, we will introduce a prototype of mutual assistance community, and show how such system meets the above mentioned goals. The function of the proposed community will be introduced, and the technologies to construct such a community will also be discussed. The persuasiveness of such a

community to attract participation will be analyzed, and its social value will also be shown through a scenario.

RELATED WORK

Much research is being carried out on building intelligent environments around people, such as Aware Home (Aware Home 2007) and I-Living (I-Living 2007). These researches on "smart houses" improved the independence of the elderly people, and reduced the required manual work. Devices such as RFID, motion detectors, etc. are used to assist the daily lives of the elderly people. The Aware Home project built up a living lab, in which they tested the user's acceptance of technology, building up a bridging framework for universal device interoperability in pervasive systems. Their researches also include discovering devices in pervasive computing environment, medical monitoring, and human computer interaction interfaces. The mission of I-Living is similar to that of Aware Home: developing an assisted-living supportive software infrastructure that allows disparate technologies, software components, and wireless devices to work together. Tasks provided in I-Living are such as activity reminding, health monitoring, personal belonging localization, emergency detection, and so on.

The above mentioned projects and many similar ones aim at providing assistive services in pervasive environments, construct a better environment and provide people with better lives. Services provided by those projects are promising in helping the elderly people to ease their lives and keep them safe by monitoring some of their health status. However, the available services provided in those projects are still limited. The scenarios in these projects are still not complete enough to meet elderly people's needs in their daily lives and help them maintain independent living.

The Amigo project (Amigo 2007), though not specifically designed for assisting the elderly people, investigated ambient intelligence for the networked home environment to provide attractive user services and improving end-user usability. Pervasive devices are managed in the Amigo project in an adaptive, context-aware and autonomous way. The system combines researches in home automation, consumer electronics, mobile communications and PC technology together to deliver services in a user centric way. The scenarios of this project proved that this system is able to provide the users with customized services. The applications are not restricted to the home environment, but extended to connect the work environment through mobile devices, and are also able to connect family members together.

The Amigo project is a huge step towards general introduction of the networked home and towards Ambient Intelligence by enlarging the usability of a networked home system. The achievements made in the Amigo project could be applied in Ambient Assisted Living for the elderly people to provide services by advanced ICT technology. However, as the Amigo project is not specifically designed to assist the elderly people living independently, there are challenges existing to fully express the potential of adopting those technologies to assist the elderly people independently living. Solutions of Amigo lack of human participation and the communication between the assisted people and the community out of their family, which inherently limits the service exploration, and may isolate the user from the outside world.

Figure 1. Side Effect of Over-Using Assistive Devices (Karlsson, 1996)

The AAL country report of Finland remarked that "the (assistive) devices are not useful if not combined with services and formal or informal support and help" (AAL Fin, 2005). We share this view and deem informal cares from relatives, friends and neighboring people as indispensable when constructing timely and cost-effectively services to assist the elderly people. The usage of assistive devices helps transfer the dependence from human side to machinery side, thus establishing some degree of independence. However, the dependence on the assistive devices unconsciously reduces the social connections of the assisted people. Without the communications with the outside world, elderly people assisted by those assistive devices are only safely surviving, but not actively living. Figure 1 shows the possible side-effect of over-using technology without proper human participation. Although the effect is exaggerated, the picture reminds us that we should be cautious not to leave the elderly people only with assistive devices, and that we should never leave them without compassion, sympathy, and social communication.

Much effort is also being made to connect the assisted people together, and carry out services based on communication between human beings. One such project is COPLINTHO (COPLINTHO 2008), which built an eHomeCare system combing forces from the patient's family, friends and overall care team. The limitation of this class of investigations is that the application is specialized on the recovery progress of a patient, thus the communications are mainly focused on exchanging the medical data of the patient, which restricted more generalized application.

All the above are examples showing current efforts to assist the elderly people living independently in their own houses. We have already seen that the advanced Ambient Intelligence technology is able to construct safety environment around the elderly people, provide them with customized services, and improve their quality of lives. We also observed that there are projects that intend to address the elderly people's needs by connecting them together, increasing their communications and keeping them active in society. However, we also find that the above mentioned solutions are either focused on technological aspect or societal aspect. We argue that effective and efficient solutions to meet the AAL challenges should combine the forces from both the technological part and the societal ones. The participations of human beings could help fully express the potential of smart devices, and maintain the social awareness of the elderly people; the usage of advanced ICT technology could better connect the elderly people together, organize community activities. In the following section, we propose a possible approach to construct such a system.

MUTUAL ASSISTANCE COMMUNITY

Rather than focusing solely on the technology facet to solve the problem of assisting aging people, we combine the advance of technology and sociology. We propose to build up a mutual assistance community where dwellers may help each other when they are able to, while assistive devices are included to build up smart environment. By doing so everyone is making their contributions to the community, and the technology and social force are seamlessly combined providing best services to the people in need.

The structure of our proposed community is shown in Fig. 2, which is a combination of assistive and ICT technologies and human participations. Assistive devices will be deployed to construct a smart house environment around the assisted people. These assistive devices will be developed as OSGi bundles and managed by a local OSGi gateway (OSGi 2007). Based on the information from the assistive devices, the local coordinator could send alarm signals when the assisted people are in a dangerous situation. Other intelligent services could be used as described in the previous smart home researches.

The most important asset integrated in our community is indeed the people themselves. Our proposed community allows disparate technologies and people working together to help people who are experiencing the inconveniences from aging or disabilities. People who are able to provide services are encouraged to do so and assist the requesting people as informal caregivers. Elderly people are also encouraged to participate in group activities, which not only help to maintain their physical and psychological health but also reduces the requests of professional medical resources. Professional caregivers (such as doctors, specialists etc.) are included in the community to provide emergency and professional medical service. Commercial vendors are also included, which diversifies the service type and brings convenience to the user, at the same time laying the foundation for economical exploitation and self-sustainability.

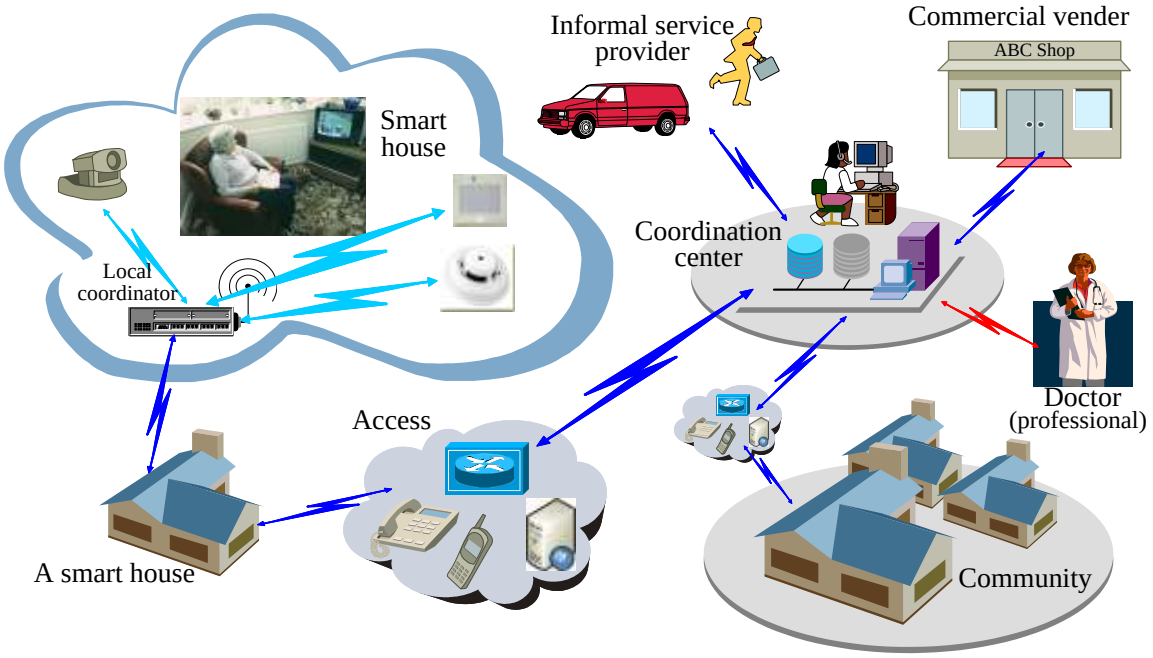

Figure 2. Organization of Mutual Assistance Community

In fact, the importance of the informal caregiver is also recognized in the projects reviewed in this paper: for instance, Aware Home points out that technology should support networks of formal and informal

caregivers, and the scenario of Amigo project also shows informal caregivers could help to provide first-aid help to neighboring people. However, the link between the informal caregivers and the elderly people are statically fixed there. Our proposed community can flexibly connect the needed help and available informal caregiver services through web service publication, matching and binding. The elderly people can also use this approach to initialize and join group activities, and inter-generational activities could also be carried out in this way. During the inter-generational activities, the younger generation could help the elderly people on physical strength demanding tasks as informal caregivers. Though often physically weak, the elderly people accumulated valuable experiences and knowledge during their lives. They may use such knowledge to assist the younger generation in solving their problems in works and studies. During this process, not only the younger generation gets their needed answer, but also the elder generation may find an access to make their contribution to our society. The elderly people may find themselves still useful, stand with more active living attitude, thus avoiding the frustration of feeling useless.

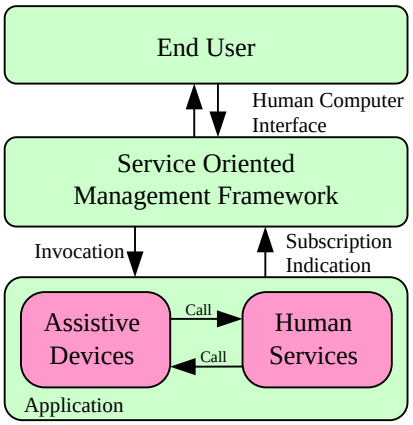

Figure 3. Service Integration

The interactions between the assistive devices, human services, and end users, under the coordination of a service oriented management layer, are shown in Fig. 3. Assistive devices and human services will interactively work together to express potentials from both sides providing high quality services to the people in need. Both assistive devices and human services will subscribe their availability through a service oriented management framework. Requested and available services will be reasoned upon in the framework, and matched available services will be invocated. End users will interact with the framework through human computer interface. In the proposed mutual assistance community, a user could be registered as a service consumer and a service provider at the same time, based on the type of services. For instance, an elderly person could request physical challenging services, while providing knowledge/experience-based advisory/consulting services.

Our preliminary research has carried out simulations on including informal caregivers: our simulation results demonstrate that the presence of informal caregivers helps reduce the social resources and provide daily assistance timely (Sun et al, 2006). We also proposed a participant model to encourage the elderly people actively participating group activities. As a result of introducing this model, the dependence on social resources is further reduced, while the elderly people's social connections are kept and even strengthened (Sun et al, 2007a). Details of such a model are given in later sections.

CONSTRUCTING THE COMMUNITY AND BRINGING IN PARTICIPATION

The previous sections stated our proposed approach to help the elderly people living safely and independently in their own houses by building up a mutual assistance community. We proposed to integrate the human services into AAL systems to enrich the available services and create a less intrusive

environment. In this section, we will discuss some of the technical issues in building such a mutual assistance community, together with open issues of attracting participation to such a community.

CONSTRUCTING THE COMMUNITY

Figure 4. Technologies to Construct Mutual Assistance Community

Figure 4 states some of the important technologies in constructing the above mentioned mutual assistance community. Smart assistive devices are still important in building up safety environments around the needed people. In our proposed mutual assistance community, the most significant contribution is to integrate the services from human side and applications from assistive ICT technologies. However, the services from the human side are quite different from those device side applications, they are very difficult to be utilized, and inherently very dynamic: the availabilities of these services are continuously changing. How to manage this dynamicity of the human services, integrate them with applications from device side and match the requested and available services become big challenges.

Generally, these challenges could be met by constructing the framework of the mutual assistance community through the Service Oriented Approach. SOA is a flexible, standardized architecture that supports the connection of various services, and as such it is an ideal tool to tackle the dynamicity problem. The application of SOA, such as the OSGi platform, can also help establish a framework such that various smart devices could be integrated together and be automatically called, started or stopped. The regulated service format will also help the process of service matching. Research efforts of using OSGi to build safety home environment are also reported in (Aiello & Dustdar, 2008).

With the rising awareness of the importance of human roles in service oriented organization, many efforts are carried out towards integrating people activities into service frameworks, which culminated in two specifications launched in the summer of 2007: WS-BPEL Extension for People (BPEL4People 2007) and Web Services Human Task (WS-HumanTask 2007). The WS-HumanTask targets on the integration of human beings in service oriented applications. It provides a notation, state diagram and API for human tasks, as well as a coordination protocol that allows interaction with human tasks in a service-oriented fashion and at the same time controls tasks' autonomy. A human-based activity (service) could be described as human tasks in the WS-HumanTask specification. The BPEL4People specification supports a broad range of scenarios that involve people within business processes, using human tasks defined in the WS-HumanTask specification. These two specifications could help meet the challenges of integrating human services in the SOA framework of the proposed mutual assistance community.

When services availabilities from human side and device side are heterogeneously represented in service oriented architectures, the remaining challenge is how to automatically and semantically map the requested and available services. The foundation for service mapping is service description. A Semantic Knowledge Base is required to precisely describe the advertised services: certain ontology libraries describing the domain knowledge of the home-care environment should be developed with the collaboration of the researchers in this domain. With such domain knowledge, conceptual model for semantic service matching could be applied. OWL-S (OWL-S, 2002) is currently the most used technology in this domain; it is able to provide a framework for semantically describing web services from several perspectives, for instance, service inquiry, invocation, composition.

There are some service matching tools developed for matching OWL-S services, such as OWL-S Matcher (Tang & Liebetruth, 2006), OWL-S UDDI/Matchmaker (Srinivasan, 2004), and OWLS-MX Matchmaker (Klusch et al, 2005). The drawback of the first two is that the matching process takes a large amount of time, while the drawback of the latter one lies in its being memory intensive (Georgantas et al, 2006). These tools serve as good starting points to investigate web service matching, while we believe more elegant and efficient matching engines should be developed. We have made some preliminary tests of service matching in home-care service matching – details can be found in our paper (Sun et al, 2007b).

The framework of the proposed mutual assistance community could be built with service oriented technology, while how to implement such a community in real-life application is still an open question. The proposed mutual assistance community could be implemented in many different forms, but in any case, technologies of virtual reality and adaptive human computer interface could help to build up a user friendly application. We envisaged that one possible way is to build up an online virtual community (Sun et al., 2008a), where people may use their avatars to easier communicate with each other. Daily activities and instruments (such as sensors, cameras, etc.) of physical life may be translated into their virtual community equivalents, and activities happening in the virtual world may trigger corresponding actions in the real world, so that inter-reality may be obtained through this virtual community. We envisage that constructing the online space in the form of virtual community will provide with a better user interface and will be easier to organize activities in and also will bring more fun to these elderly people.

Group activities will be easier organized by building such a virtual community. Communication among elderly persons may also be increased with such community. Elderly persons are typically glad to meet each other and, e.g., recall things happened in their lives. Some websites are constructed to provide an online space for the elderly people to communicate as a community, such as Seniorennet (http://www.seniorennet.be/) and others. We envisage that online community could better connect the elderly people together and assist them to hold group activities.

Building the online virtual community could also provide an easier way to implement intergenerational mutual assistance. In such communities, the strength of the avatars is only based on their knowledge and activeness in the community. Elderly people may use their knowledge to help the younger generation and become active contributors in the community. They may build a good image for their avatars, and they may also feel happy by finding themselves still “useful”. The elderly people may also post their requests for physical demanding tasks online, and receive help from younger generation offline, in their physical lives.

Combining services such as Google Earth and YouTube, the online community may also bring the elderly people a better view of the outside world. Due to their health conditions, some requests of the elderly people are impossible to realize in physical life – such as visiting places where they had good memories of as a youth, or places they always dreamed to go and never had the chance to. These requests may also be realized in the virtual community by taking a virtual tour. The virtual community we intend to build is to deliver services in the physical world to elderly people, and bring them entertainment. But if requests

cannot be realized in the physical world, within the virtual world, we have the chance to reformulate it in a virtual context, where physical abilities are less important. By doing so the satisfaction of the people could be improved.

RAISING USER ACCEPTANCE

People's willingness to participate in AAL systems needs to be investigated and encouraged – how to encourage people joining e.g. a mutual assistance community is a big challenge.

We deem that any truly effective AAL system cannot leave aside the contributions coming from society itself, in all forms, with the participation of informal caregivers, professionals, and even the elderly people themselves. In order to encourage more people to make contribution to AAL system, we need to understand their drives to provide help to others, and stay active in the community. The main drive for people to help others is not merely money, but also includes moral duty and their social image. One main reason that keeps people active in an online community is to build up a good image for their avatars and win respect from other community residents. An AAL system with participation of informal caregivers could also reward the informal caregiver in this way. Social studies to stimulate people to work occasionally as volunteers should be thoroughly carried out.

Besides the willingness to help others in the mutual assistance community, elderly people's willingness to make use of their assisting systems also needs to be studied and encouraged. We would ascribe the elderly people's unwillingness to use assisting system from two folds – psychological one and technological one. In the rest of this section we introduce these two aspects in detail and explain how we made efforts to reduce this unwillingness.

Breaking Psychological Frustration:

When people are getting old, a relevant source of frustration comes from losing physical strength, but what possibly torches them most lies in the psychological domain: they are becoming passive consumers of the societal services rather than active creators. In so doing, they also lose their self-esteem. Almost all of the AAL systems for the elderly people consider their users as people who are weak and passively assisted by others. For the designers of such systems, being able to maintain some degree of independence without bringing too much burden to our society appears as an already ambitious goal. However, those systems neglect the fact that the elderly people can still make their contributions to our society through their valuable experiences. Our proposed mutual assistance community could help encourage the elderly people to actively participate in group activities as peer participants, and possibly even to use their experiences to help the younger generations solve, e.g., some of their work and school problems (Sun et al, 2008b). Such possibilities will be discussed in more details in the following section. Such activities provide the elderly people with the chance to living creatively and with self-esteem. We hope this could help attract the elderly people to join in the mutual assistance community and make contributions to our society.

Breaking Technical Frustration:

Elderly people usually have difficulties in getting accustomed to the application of new technology. In order to help them get used to the ambient assistive devices and "break the grey digital divide," we should construct user friendly interfaces, and also provide appropriate trainings to the users. Developing adaptive, straightforward, and multimodal human computer interfaces is the challenge of future interfaces in assisted living (Kleinberger et al., 2007). Improving the ICT knowledge of the elderly people to include them in the information society is receiving more and more attention from the governments, and

corresponding courses are provided to the elderly people. It is also suggested to get people involved in how to use the assistive devices before they really need it (Floeck & Litz, 2007).

It also transpires that the technical barrier could also be broken when people have a strong drive to do so. Social connection is one such drive. Former CEO of Netscape Andreessen recalled how people broke the technical barrier to surf online when Netscape came to the public more than ten years ago:

> *"There was no shortage of skeptics at the time, who said that none of this would work because it was all too complicated. 'You had to go out and get a PC and a dial-up modem. The skeptics all said, 'It takes people a long time to change their habits and learn a new technology.' [But] people did it very quickly, and ten years later there were eight hundred million people on the Internet. People will change their habits quickly when they have a strong reason to do so, and people have an innate urge to connect with other people," (Friedman, 2005, pp. 62-63)*

In our mutual assistance community, elderly people do not only benefit from keeping connected with other people, but also are provided chances to make contributions to society, to feel that they are still useful, and to live in an active way with self-esteem. Such benefits could provide our elderly people with further stimuli to break the technological barrier.

ELDERLY PEOPLE IN THE COMMUNITY

As mentioned above, the proposed mutual assistance community could virtually connect people together and help the elder people have longer, better, and more active lives. In our proposed mutual assistance community, the elder people may increase their independence by participating in group activities. Moreover, they may actively make contribution to our society through intergenerational activities, thus increasing their self-esteem. In what follows we first introduce the concept of participant and explain its significance within our community. After this we introduce the concept of intergenerational mutual assistance.

5.1 Participant Model for Group Activities

The concept of participant (Sun et al, 2007a) comes from the fact that some activities which the elderly people want to engage in may require more than one people to be enacted. Examples include e.g. walking in the park with someone else, playing chess, chatting, and many others. Instead of asking for nurses or informal caregivers to meet these requests, the participant model would encourage the elder people to participate or initiate group activities to autonomously meet such needs when this is possible and safe. When elder people want to initiate or join a group activity, they will send a request to participate their activity. The request will be parsed by a service center. If such a group activity is ongoing, the requester could join this activity directly; otherwise, based on the time constraint of the requester, the system will either initiate a new joint activity or try to find service from informal or professional caregivers to fulfill the user's requirement.

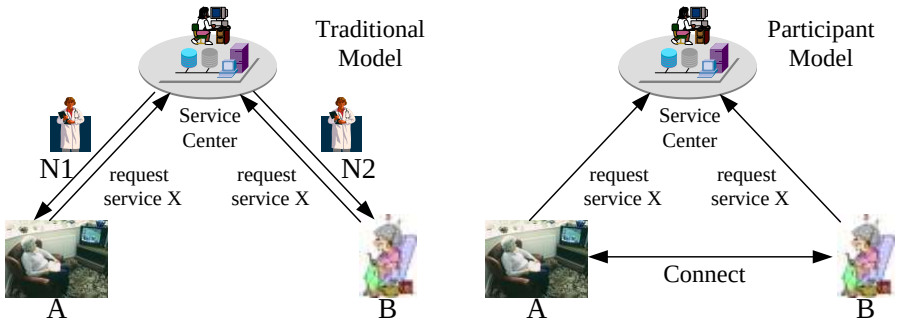

Figure 5. Comparison between traditional model and participant model

Figure 5 compares the participant model with the traditional one. A and B represent elderly people, N1 and N2 represent care-givers. When A and B want to participate a same event, the service center will try to establish a link between them in the participant model rather than requesting for help in the tradition model. Additional services are thus spared, so that the social costs are reduced; and such group activities also encourage social contacts and produce self-esteem (as the elder people may stay active without assistance). Moreover, the peer-to-peer nature of the participant model does not classify the participants into caregivers and caretakers, which also helps preserve the dignity of elderly people.

5.2 Intergenerational Mutual Assistance

Intergenerational mutual assistance refers to activities held between elder generation and younger generation, each side using their special knowledge and capabilities to help the other side. When people are getting old, their mobility is degrading, and they are becoming physically weak. In our so called intergenerational mutual assistance, the younger generation could help the elder one on physical strength demanding tasks as informal caregivers. Though physically weak, the elder people accumulated valuable experiences and knowledge during their lives. They may use such knowledge to assist the younger generation solve their problems in work and studies. During this process, not only the younger generation gets their needed answer – the elder generation also finds an access to make their contribution to our society. Elders may find themselves still useful, stand with more active living attitude, thus avoiding the frustration of considering themselves as “useless”.

Our society may also benefit from these intergenerational mutual assistance activities. Less assistance would be required for helping these elder people as many requests are completed by the younger generation as informal caregivers. The knowledge and experience of the elder generation may also pass by to the younger ones, which would be beneficial for their studies and works. The result is that the social resources are utilized in a more efficient and effective way.

SCENARIO

To better illustrate the functions of our proposed mutual assistance community, we will use a scenario to show how the community organizes group activities.

Scenario: Participation in Group Activities

Mary is 70 years old and lives alone in Antwerp, Belgium. In the afternoon of a sunny day, Mary wants to have a walk in the Middelheim Park, which is close to her home. She wants to have somebody to accompany her during her walk. Mary decides to use the mutual assistance community to find someone who also wants to have a walk in the park. She switches on the TV, which is the graphical interface of the mutual assistance community. She navigates the service menu, which is built as an ontology tree, and selects the “Group Activity”. A few photos will be presented to her, representing group activities such as chatting, exercise together, etc. Mary chooses the symbol of walking; she types in the location she wants to hold this event as “Middelheim Park”. For the service organization, Mary chooses to receive service from peer “participants”; she specifies the deadline as “today, 8pm”, and she chooses to forward the service request to “relatives” in case that no such service is found till the deadline.

After making such inputs, the service matching engine will start searching for the appropriate services. The service matching engine is located in the service matching center. Available services are advertised in the service matching center. The service matching engine then produces a list of available services, and

ranks them by their relevance to the users' requirements. This way the system can best fit the users' requirements. The settings for the search, translated from Mary are as follows:

Required Service: Walk with someone.
Location: Middelheim Park, Antwerp.
Deadline: 8pm, 1st, August, 2007.
Service Form: Participant of Group Activities.
Action if no match found: Forward to "relatives"

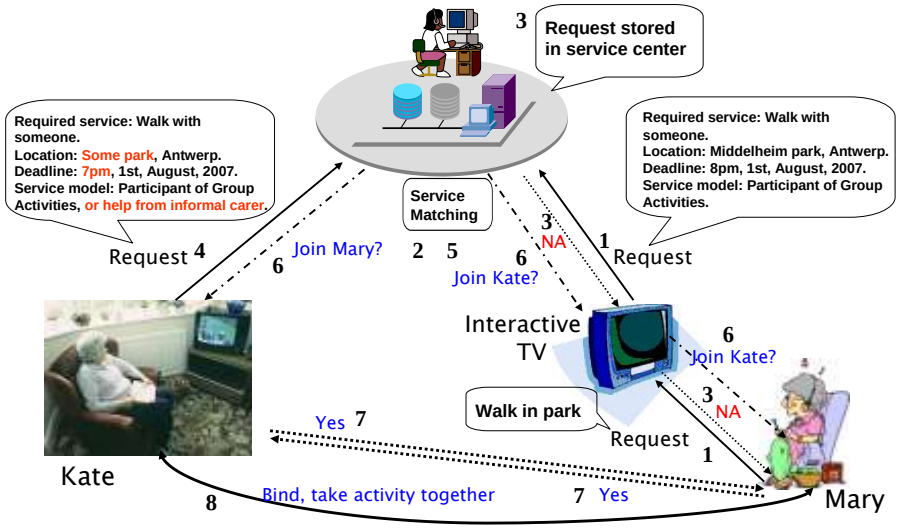

Figure 6. A Scenario of Organizing a "Participant Activity"

Unfortunately, the service matching engine could not find matched or similar service for Mary, so it will notify Mary that no matched services/requests are found. Nevertheless, the request from Mary is still kept in the service center before the deadline meets.

Luckily, some minutes later, Kate submitted a similar request, which is also displayed in Fig. 6. This time, the system found that Kate's request is similar with the one from Mary, the degrees of match on different criteria are shown in Table 1.

Table 1. Service Matching

Criteria	Mary	Match Degree	Kate
Required Service:	Walk with someone.	Match	Walk with someone.
Location:	Middelheim Park, Antwerp.	Sub_class of	Some Park, Antwerp.
Deadline:	8pm, 1st, August, 2007.	Parent_class of	7pm, 1st, August, 2007.
Service Form:	Participant of Group Activities.	Sub_class of	Participant of Group Activities, or Informal Caregiver

The screen in Mary's interactive TV will notify her that it is now possible to meet her request: "*Kate* initiated a *walking* activity in *some park (includes Middelheim Park)* by *7pm today*; if you agree to take this *group activity* with *Kate*, press the **confirm** button and we will forward *Kate* your contact information."

Mary agrees to join this activity, she presses “confirm”, while, at the other side, Kate also confirms the participation of Mary, agreeing on Middelheim park as an acceptable venue. Their contact information is then displayed on their TV screens respectively, they call each other to confirm the time and place to meet, and have a nice time walking in the park later.

In this scenario, Mary and Kate take the group activity – walking in park – together. No additional help is required to meet their requests, so that social resources are effectively saved, and they also avoid the possible frustration of having to be taken care by others. Figure 6 illustrates the actions taken in this scenario; the numbers displayed indicate the steps of the indicated action, the indicator “NA” means “not available”. For technical details about service matching, readers may refer to our previous paper (Sun et al, 2007b).

CONCLUSION

This chapter discussed what we considered as being some crucial issues in building AAL systems. We proposed to solve those issues by building up a mutual assistance community to effectively provide services for the elderly people. Current researches efforts of building pervasive home-care environment are also discussed in this chapter. Much work is focused on building pervasive home-care environments with advanced Ambient Intelligence, but such approaches also face a concrete threat: the possible social isolation due to the over-use of technology and lack of the communication between the assisted people and the outside community. We believe effective and efficient solutions to assist the elderly people independently and actively living should leverage the efforts from both technical side and social side.

In this chapter, we also introduced a prototypic implementation of a mutual assistance community, where people are mutually assisting each other, and human services and device applications are heterogeneously integrated. Smart devices can still be used in such a community to guarantee the safety of elderly people. Informal caregivers, together with commercial venders and professional caregivers are also actively involved in, which diversifies the service categories. The increased amount of services also indirectly improves the efficiency and effectiveness.

The active roles of the elderly people envisaged in our mutual assistance community are also presented. The elderly people could organize group activities according to a so-called ‘participant model’, where people may participate as peer levels rather than receiving help from others. Societal resources may be saved as additional services are spared. Intergenerational mutual assistance activities are also encouraged where the younger generation and the elder generation is mutually helping each other. Social resources are thus utilized with efficiency and effectiveness. The elderly people may also found themselves still able to make contributions to our society, thus raising their self-esteem.

The mutual assistance community presented in this chapter is our vision on how to assist the elderly people aging well, rather than a full fledged real-world implementation. This notwithstanding, needed technologies and researches have already been investigated and we carried out preliminary researches on organizing services in the target domain. Challenges on building up such a community have been stated both on the technical side and for user acceptance concerns. Possible solutions to meet these challenges have also been provided. Technical issues in implementing such a mutual assistance community, e.g. service organization, service mapping, etc, are briefly discussed to give a general introduction. A scenario is also given in this chapter to illustrate the participation of a group activity in such a mutual assistance community. Our plans for the near future include completing our implementation and deploying it in real-life scenarios. We hope the issues we discussed in this chapter could raise our readers’ awareness of the importance of human participation.

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