Towards longer, better and more active lives: mutual assisted living community for older people

Towards Longer, Better, and More Active Lives

- Building Mutual Assisted Living Community for Elder People

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Abstract:

The proportion of elder people will keep increasing in this century and already becomes a predominant aspect of our societies. Solutions both efficacious and cost-effective need to be sought to provide needed services to the elder people timely. In order to help the elder people living actively, solutions should also provide chances for them to get involved in social activities and communicate with the outside world. In this paper, the concept of mutual assistance community will be introduced, which aims at promoting longer, better, and more active lives for the elder people.

1. Introduction

As well known, the proportion of elder people keeps increasing since the end of last century. The European overview report of Ambient Assisted Living (AAL) investigated this trend [1]. The studies of EUROSTAT [2] 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, while that over 80 (3.6% in 2000) is expected to reach 6% by 2025 and 10% by 2050.

Studies of Counsel and Care in UK found out that elder people would prefer to live in their own house rather than in nursing homes, thus they need support to remain independent at their home [3]. In order to improve the quality of life for the elder people, it is important to guarantee that assistance to those people is timely arranged in case of need.

Assistive devices are developed to facilitate the daily lives of these elder people. But they also have their limitations: For instance, in the AAL country report of Finland, it was remarked that "the (assistive) devices are not useful if not combined with services and formal or informal support and help" [4]. We share this view and deem informal caregivers as indispensable when constructing timely and cost-effective services to assist the elder people. We developed a design tool to evaluate the performance of informal caregivers in so-called mutual assistance communities [5]. Simulations have shown that informal caregivers are indeed capable to contribute effectively to the community welfare. Our research also finds out that when elder people are encouraged to participate in group activities, their social network is maintained, physical practice is encouraged, and a subset of their needs are met by activating or participating in a group activity, rather than requesting the service of professional caregivers.

Further on, we proposed to construct the mutual assistance community based on Service Oriented Architecture (SOA), where helps from human side and applications from assistive devices are both described as services, and seamlessly integrated to provide the most effective services to the people in need [6]. Our proposed mutual assistance community provides an open access to people, regardless of their age. Both elder and younger generations could enroll in such a community. The younger generation could assist the elder generation on physical demanding tasks, while the elder generation could also use their valuable experience to help the younger generation to solve problems – e.g. during their work and studies. In so doing,

intergenerational activities could be carried out, social connections could be enhanced, and requests from elder and younger generations could be met in a most efficient and effective way.

The remainder of the paper is organized as follows: In Section 2, related work is reviewed. Our proposed mutual assistance community is introduced in Section 3. Benefits brought by such a community are presented in Section 4, and conclusions and future work are given in Section 5.

2. Related work

Much research is being carried out on building intelligent environments around people, such as Aware Home[1], I-Living[2]. This research on "smart houses" improved the independence of the elder people, and reduced the required manual work. Devices such as RFIDs, motion detectors, etc. are used to accomplish tasks such as activity reminding, health monitoring, personal belonging localization, emergency detection, and so on. However, their limitation is the lack of communication with the other people outside the house, which inherently limits the service exploration, and may isolate the user from the outside world. Keeping the elder people physically healthy is crucial, but helping them live in a normal and comfortable way is also important, and the communication between other people is indispensible to meet this goal.

There are some projects that begin to focus on the communication with the outside world. One such project is COPLINTHO[3], which built an eHomeCare system combing forces from the patient's family, friends and overall care team. The limitation of this class of investigation is that the application is restricted to the recovery progress of a patient, thus the communication is mainly focused on exchanging the medical data of the patient.

In order to improve the efficiency and effectiveness to assist the elder people to live independently, we believe the perspective of this problem should be focused on community level, rather than building safety environment on individual level; in order to help the elder people living well, it is important to let them actively participate the events in their community. In the keynote[4] of ePractice's Aging Well workshop, it was pointed out that "Active ageing refers to a continuous participation in social, economic, cultural, spiritual and civic affairs, not just the ability to be physically active or part of the labour force. Active ageing views older people as active participants in an age-integrated society." It further stated that aging well in the society means "staying socially active and creative, improving quality of life and reducing social isolation".

The NeAT (Newham Advanced Telecare) project[5] targets on assisting the vulnerable people active aging in Newham (a village in East London), on the community level. Broadband connections are widely applied in this project, connecting people together with their friends and relatives. Multi-channel services centered around a set-top box provide services including education, audio/video conference, etc. The impact of this project is that it builds up infrastructures to deliver wide range media services through the broadband "pipe". Some challenges of this project, as they stated in the cited workshop, are "How to deliver the integrated services?", "How to benefit the investor?", and "Where does Assistive Technology best sit?"

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[1] See Aware Home Project, http://awarehome.imtc.gatech.edu/
[2] See I-Living Project, http://lion.cs.uiuc.edu/assistedliving/
[3] See COPLINTHO Project, https://projects.ibbt.be/coplintho/
[4] See http://www.epractice.eu/files/upload/workshop/13771-1208261154.pdf
[5] See NeAT Project, http://www.newham.gov.uk/

All these above mentioned projects represent examples of the existing approaches that construct home assistance services. We may classify the approaches as person-oriented, family-oriented, and community-oriented. Person oriented assistive devices help to construct safety environment, and provide some tasks to enhance the daily lives of the elder people; family-oriented individual networks help to increase the connections between the assisted people and their families; and the community-oriented scheduling system inspires the study on effectively utilizing the social resources in the community level.

In the following section, we propose to construct mutual assistance community to harmonize the application of assistive devices and services from human side. Our proposed mutual assistance community could meet the above mentioned challenges and goals on the community level.

3. Mutual Assistance Community

Rather than focusing solely on the technology facet to solve the problem of assisting aging people, we combine the advances 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 still included to build up smart environments. 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.

3.1 Structure of the Mutual Assistance Community

The structure of our proposed community is shown in Figure 1, 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[6]. 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 applications of smart devices could be used as described in the previous smart home researches.

The most important asset integrated in this community, we think, is the people themselves. People located inside the community are connected together via different means of communication media, such as phone lines, mobile phones, the internet, etc. For the elder people who are not familiar with new technology, the system allows them to access the community via interactive TV. For the younger generation, they may connect to the system by their smart phone or PDA, and serve as informal caregivers when they wish to. In this way, the different characters in the community are seamlessly connected, which allows disparate technologies and people working together to helping those who suffer from aging or disabilities.

In the above mutual assistance community, people who are able to provide services are encouraged to do so and assist the requesting people as informal caregivers. Informal caregivers could be e.g. relatives, friends, or neighbours of the people who need service. We expect the involvement of the informal caregiver could reduce the dependency on the socio-medical care system.

Elder people are also encouraged to participate in the group activities, which helps to maintain physical and psychological health and 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 – they are indispensable to provide professional emergent services on professional medical caregiver or other challenging and professional healthcare.

[6] OSGI. Open Service Gateway initiative, OSGI Service Platform Version 4, http://www.osgi.org/

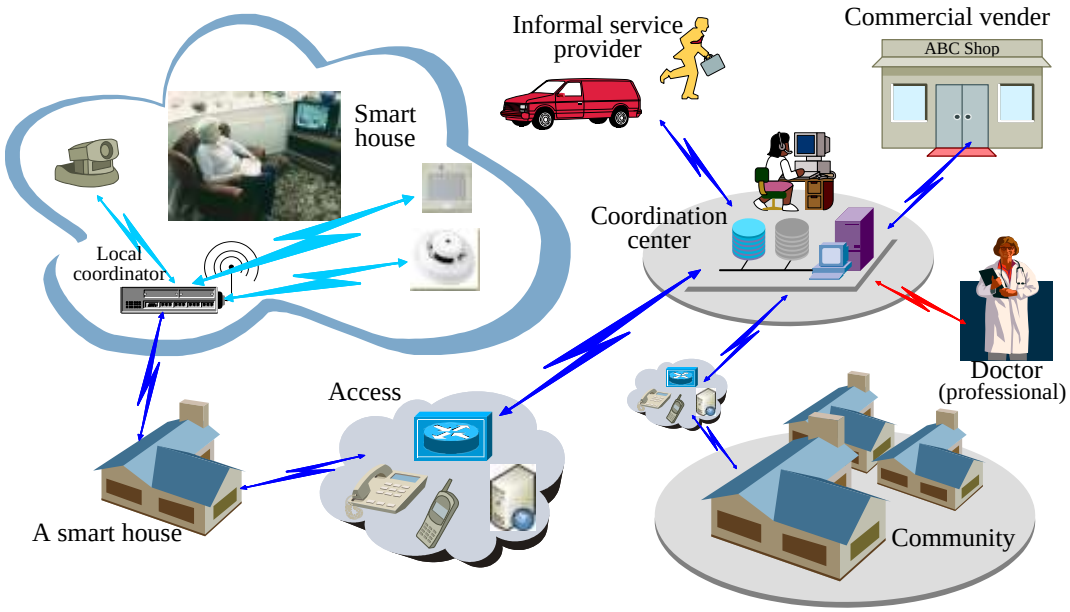

Fig. 1 Organization of Mutual Assistance Community

Commercial vendors are also included in, which brings great convenience to the user and diversifies the service type. At the same time, including the commercial services lays out the foundation for self-sustainability and economical exploitation.

3.2 Constructing the Mutual Assistance Community

Fig. 2 Technologies to Construct Mutual Assistance Community

Figure 2 states the needed technologies to construct the mutual assistance community shown in Figure 1. The framework of the mutual assistance community is organized through SOA. SOA is a paradigm for organizing and utilizing distributed services (capabilities), allowing different applications to loosely couple together. Service providers describe and publish their services through service registry; service consumers look up wanted services also through the service registry. Once the availability of a needed service is verified, the service provider and service consumer will be bond together, and service will be delivered between them. In our mutual assistance community, requests

for help, applications from assistive devices, and available services from commercial vender and different carers are all described as services, and the matching process between request and available resources is taken in the coordination center automatically. The software architecture of the community, constructed with service oriented approach, is shown in Figure 3.

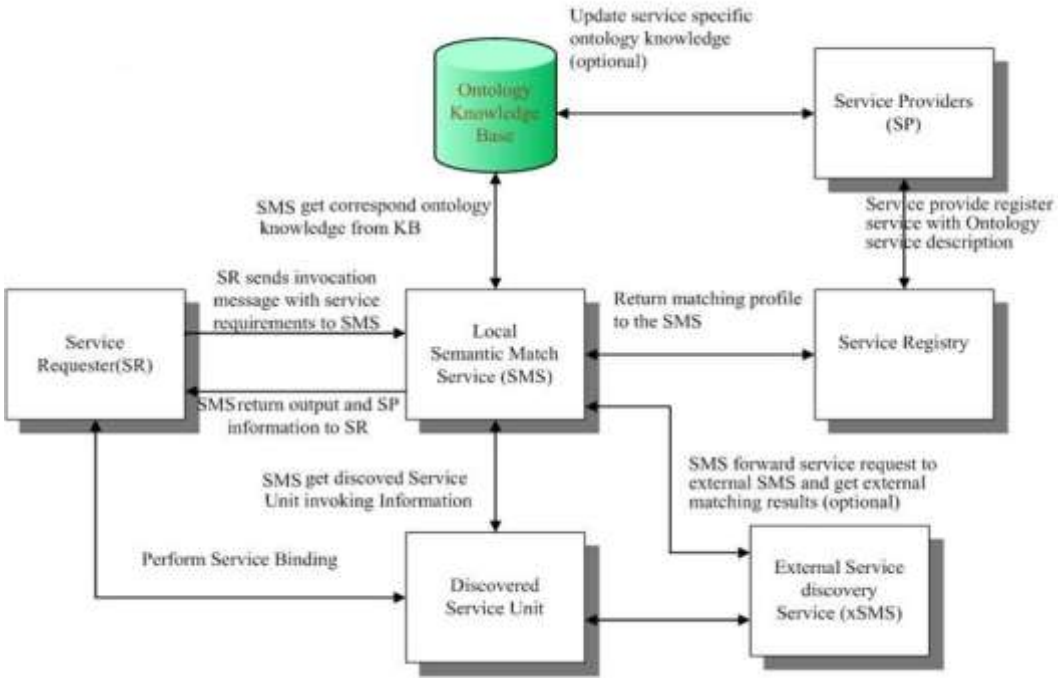

Fig. 3. Service Oriented Software Architecture

Smart assistive devices are still necessary to build up safety environment around the needed people. Applications provided by the smart devices will be represented in the form of services, and published in the SOA framework. The most important asset of the community, people themselves, are also integrated in the community through the service oriented approach – the requests of services and the abilities to provide services are published as service requests or service registrations. Human task computation defines services implemented by people as "human tasks", and aims at integrating the human tasks in service oriented applications. The WS-HumanTask specification [7] and the BPEL4People specification[8], both launched in June, 2007, could be the beacon to bringing human activities into service oriented applications.

Semantic service description and matching is the bridge which connects the needed services and available resources. The dynamical availability of human services could be solved as the SOA framework is able to track automatically the change of services using service registry or declarative services. An ontology library [7], which defines objects and the relationship between certain objects in the ambient assisted living domain, should be pre-built so that the objects used in the service description could be recognized. Service matching tools already exist, such as OWL-S Matcher [8], OWL-S UDDI/Matchmaker [9], and OWLS-MX Matchmaker [10], but their efficiency still requires improvements. Details of service matching in mutual assistance community can be found in our paper [11].

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[7] See Specification: Web Services for Human Task (WS-HumanTask), version 1.0. http://download.boulder.ibm.com/ibmdl/pub/software/dw/specs/ws-bpel4people/WS-HumanTask_v1.pdf

[8] See Specification: WS-BPEL Extension for People, (BPEL4People), version 1.0. http://download.boulder.ibm.com/ibmdl/pub/software/dw/specs/ws-bpel4people/BPEL4People_v1.pdf

Technologies of virtual reality and adaptive user interface could be applied to create better user interface and increase the user acceptance. Virtual reality techniques could help to build up online mutual assistance community, imitating the community in real-life, bringing virtual tours to people who are not able to carry them out in real-life. Adaptive user interfaces could help break the technological barrier currently experienced by some of the elder people.

4. Longer, Better, and More Active Lives

The proposed mutual assistance community could 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 group activities, thus increasing their self-esteem. Moreover, they may actively make contribution to our society through intergenerational activities.

4.1 Participant Model for Group Activities

The concept of participant [12] comes from the fact that some activities which the elder people want to engage in may need more than one people to participate, such as walking in the park with someone else, playing chess, chatting, etc. 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 elder people want to initiate or join a group activity, they will send a request to participate this 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 care-givers to fulfill the user's requirement.

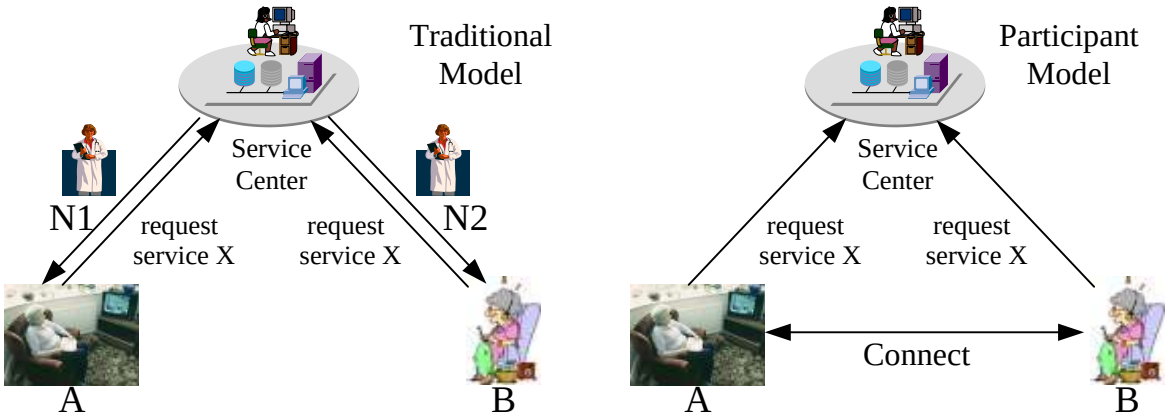

Fig. 4. Comparison between traditional model and participant model

Figure 4 compares the participant model with the traditional one. A and B represent elder 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).

4.2 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 younger generations 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, so that the social resources are utilized in an efficient and effective way.

5. Conclusion

This paper discussed the current issues of helping the elder people independently living. Although the smart devices promised to build safety environment to support independent living, the lack of involvement of human being reduces the social connections of the assisted people and the outside world, and make them live in passive and inactive ways.

We suggest making efforts to combine the advances of machinery and human being, to seamlessly provide services to the elder people. Mutual assistance community, where people are mutually assisting each other, is recommended to realize the above mentioned goal. Smart devices can still be used in such as community to guarantee the safety of elder people. Informal caregivers, together with commercial venders and professional caregivers are also actively involved in, which diversifies the service categories. The concept of participant model is proposed to organize group activities, 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 are mutually helping each other. Social resources are thus utilized with efficiency and effectiveness. The elder people may also found themselves still able to make contributions to our society, thus raising their self-esteem and living with active attitude.

The structure of our proposed mutual assistance community has been presented. Such a structure is our vision on how to assist the elder people aging well, rather than a real-world implementation. Needed technologies and researches have been investigated and we also carried out preliminary researches on organizing services in the target domain. The next step of our research is to call for wide collaborations from industrial, academic and government to bring this proposed mutual assistance community into real implementation.

6. Reference

[1] H. Steg, et al. Ambient Assisted Living – European overview report, September, 2005.

[2] EUROSTAT. www.eurostat.com: ECHP - UDB, 2004.

[3] Counsel and Care, Community Care Assessment and Services, April, 2005.

[4] AAL Finland. Ambient Assisted Living, country report, Finland, 2005.

[5] H. Sun, V. De Florio and C. Blondia. A design tool to reason about Ambient Assisted Living Systems. *In the Proceedings of the International Conference on Intelligent Systems Design and Applications*, Jinan, China, 2006.

[6] N. Gui, H. Sun, V. De Florio and C. Blondia. A Service-oriented Infrastructure Approach for Mutual Assistance Communities. *Proceedings of the First IEEE WoWMoM Workshop on Adaptive and DependAble Mission- and bUsiness-critical mobile Systems (ADAMUS 2007)*, Helsinki, Finland, 2007.

[7] Dean, M.; Schreiber,G.; Bechhofer,S., et al. OWL Web Ontology Language Reference, 2004.

[8] Tang,S.& Liebetruth,C. The TUB OWL-S Matcher. http://owlsm.projects.semwebcentral.org, 2006.

[9] Srinivasan, N. OWL-S UDDI Matchmaker. http://projects.semwebcentral.org/projects/owl-s-uddi-mm/, 2004.

[10] Klusch, M, et al. OWL-MX Matcher. http://projects.semwebcentral.org/frs/?group_id=90, 2005

[11] Sun,H.; De Florio,V.; Gui,N. and Blondia,C. Service Matching in Online Community for Mutual Assisted Living. in the Proceedings of The Third International Conference on Signal-Image Technology & Internet Based Systems (SITIS' 2007). IEEE Computer Society. Shanghai, China, 2007.

[12] Sun,H., De Florio,V., Gui,N. and Blondia,C. (2007.). Participant: A New Concept for Optimally Assisting the Elder People. In the Proceedings of the 20th IEEE International Symposium on Computer-Based Medical Systems (CBMS-2007), Maribor, Slovenia.