

Globally supporting the elderly well-being using suitable HCI

Ana C. Andrés del Valle, Marion Mesnage and Agata Opalach
Accenture Technology Labs - 449 Route des Crêtes - BP 99 - 06902 Sophia Antipolis – FRANCE
{ana.c.andresdelvalle}@accenture.com

Unlike what is usually considered, Health is not only the absence of disease or infirmity but also a state of complete well-being that includes physical, mental and social aspects. In this position paper, we show how new technologies and the latest research on Human Computer Interaction could help the elderly to better keep their health up in a global manner. Researchers at the Accenture Technology Labs are doing research and building prototypes aimed at proving that technology can be made accessible and useful to the elderly. This paper presents our perspective on the subject backed by the discussion of some of the prototypes we have built under the Intelligent Home Services initiative. This initiative's effort aims to allow older people to age autonomously at home.

Autonomy, sensing, connecting, supporting, health, elderly

1. INTRODUCING ACCENTURE'S INTELLIGENT HOME SERVICES INITIATIVE

Older people wish to remain independent and avoid living in institutions. Technology can help them to age at home. Unfortunately, special devices are not conceived to be utilized in a natural way. They require learning that is difficult for older people. More effort is needed to give technology the suitable characteristics for an intuitive use.

With this statement: “*health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” [2], the World Health Organization defines health as a global condition. Unlike other initiatives, where assessing physical health becomes the main concern, Accenture's Intelligent Home Services [1] address the challenge of improving the elderly life studying how technology can help globally. We look at technology from three perspectives: sensing the older person's environment, enhancing the way they communicate with their external world and supporting their daily activities to help them control their own well-being.

2. SENSING. BACKBONE OF INTELLIGENT HOMES

Sensors are the backbone of any intelligent system. The more a system knows about people's location and activities, the better service it can offer to them. We need as much and as varied information as we can get to build useful reasoning. Natural human activity is complex to analyze automatically. To assess a person's activity we can use complementary sensing methods. Wearable sensors, especially biosensors, have the advantage of continuously measuring parameters directly related to health while allowing for high mobility both inside and outside the home. However, they are often cumbersome to wear because of power requirements and can easily be forgotten. Embedded sensors placed in the environment have the advantage of being passive and transparent to the person. They also have longer durability and can afford higher power consumption. However, they limit the mobility of the person to areas where they are installed.

Accenture's **Activity Monitoring** prototype [3] is a camera-based tracking that gives accurate information about people's locations in the environment and history of their trajectories. This system permits providing relatives with visual feedback on the elderly daily activity. Specifically, falls are detected and relatives receive an SMS alert with a warning and a picture of the older person after the fall. The elderly could also profit from the visual interface that informs of their daily activity; it could become a simple way to remind them when they did what. Although camera-based systems are often considered intrusive, their easy management and the peace of mind that they give to relatives compensate for this. The big advantage of this system is that, once the system is deployed, the older person does not need to learn how to interact with it. If the system guarantees some privacy and security, he will be able to act naturally and he will barely feel that the cameras are around him.

The **Online Health Services** prototype uses physiological sensors to make the human body machine-readable. Instantaneous data give a snapshot of body state, useful for the person, especially if caution is needed in daily exercise or diet (cholesterol, diabetes, ...) Data over time allow predictive health monitoring. Reasoning is based on combination of complementary physiological signs that together may indicate the existence of a problem. A visual representation of the human body showing the person's vital signals plus some clarifying diagrams and overtime graphs ease understanding the physical health state and evolution to not experimented users of the system.

Multimodal, contextual and continuous monitoring gives tools to better assess overall well-being, including the three aspects of health: physical, mental and social.

3. CONNECTING. ENHANCED COMMUNICATIONS

As people get older, they capability to move and act decreases. This influences negatively their social life because they stay home alone for longer periods of time. Often, this situation isolates them and sometimes, this isolation is a cause for potential depression. Lack of communication might lead to fatal consequences because the older person might not know where to look for help when it is needed. Strong communication ties between the elderly

and the outside world could prevent problems. Current advanced communication technologies such as email, videophones, videoconference, Internet fail to address the particular social needs of the elderly. To solve this, we propose two communicating interface concepts:

- **Interactive Picture:** is a direct link that relates the older person to each person or entity he wants to communicate to. Merging all technologies in one object representing the person we want to connect to makes communications fast, intuitive and natural to use. Communications through this object are tailored to the people that will communicate therefore it becomes easy to use. The Interactive Picture prototype is a frame that connects the elderly person with her son (pictured inside the frame) wherever he is. The frame is enabled with different technologies whose use is completely transparent to the older person. She uses traditional means like a pen or her voice to express herself, the Interactive Picture chooses the appropriate communication channel to connect her to her son.

- **Connective Tables:** are interfaces that build a bridge between technology and people. This is accomplished by embedding the interfaces onto the objects that are relevant to the elderly because, as we get older, we lose our learning ability and the use of regular objects eases learning tasks. Using the Connective Tables prototype, relevant objects located on a table at one end of a remote communication are projected on another table at the other end. With this kind of system, we extend the range of activities that are possible to share beyond what traditional communications offer. This adds richer social aspects, thanks to the object interaction. To study the potential of this technology to help the elderly, we have created a remote scrabble game for our prototype. Other scenarios exist where these tables can be of great help to the elderly like, for instance, getting visual assistance while filling tax forms.

Both technological trends aim at rendering technology intuitive, natural and social to the user.

4. SUPPORTING. LOCATING THE USER IN THE CENTRE

The elderly gain autonomy and independence controlling their own well-being. Context-aware computing encloses technological solutions that provide user support. Within this framework, the user's activity is the centre of attention. Reasoning and reaction focus on the user and are given for the user's profit. The **Online Medicine Cabinet** prototype watches the older person activity around his medicine cabinet and assists him daily. It is an integrated home health station that provides everything a person needs for individual healthcare: personalized information, timely reminders about medications and medication compliances, vital sign monitoring, and the convenient but secured access to doctors, hospitals, pharmacies, and other care providers. It is a good example of situated healthcare. Unlike health portal like WebMD [4], which sits somewhere on the Internet far away from their users, the medicine cabinet resides in the everyday space of the patient, i.e., home.

Ancient cultures already knew the mutual influence that body and mind have on each other – “[...] *mens sana in corpore sano*” [5]. Certain activities crucial for a healthy life (e.g. diet) are difficult to maintain. Psychological support can help elderly achieve their goals. Computerized persuasion uses technology to encourage people to change their behaviour. It could be integrated into daily life in a form of a “nagging” object, a device that “knows” the person's behavior with relation to their goals (e.g. number of cigarettes smoked for a person trying to manage their smoking) and that gives the user feedback rewarding positive (fewer cigarettes) and discouraging negative (more cigarettes) behavior. The **Persuasive Mirror** prototype [6] is an augmented digital mirror using two cameras placed on two sides of the screen. Multimodal activity monitoring, as described earlier, can be used for behavior analysis (we could use shopping bills or RFID/barcode readings to know the person's cigarette consumption, the user can also enter the number of cigarettes manually). The mirror will then give visual feedback on behavior by rendering the person older for negative behavior and younger/healthier looking for positive behavior.

5. CONCLUSIONS

This paper has presented Accenture's Intelligent Home Services. This initiative tackles the challenge of improving the elderly lifestyle at home from a global perspective. It includes improved healthcare by enabling alerts of crisis and emergencies, continuous, contextual, rich data monitoring, activity predictions and long-term trending. It also covers social aspects of the elderly life by alleviating isolation through the integration of ambient communications, natural and easy-to-use interfaces, and the potential for sharing activities and physical experience. Psychological support for their daily life is also possible thanks to context-relevant guidance, daily coaching, and personal compliance check.

Accenture, a global IT services company, is investing in research in this domain because the **demographic change is inevitable**. It will affect businesses in a variety of ways, through their workforce and clients. Now is the time to think about the implications. We do not have all the answers but we work with our client to look for solutions most adapted to their business. Home care and telecare are examples of **drivers that will bring technology into the home**. With this infrastructure in place, businesses and governments can offer additional services.

Researchers at Accenture Technology Labs will continue to look for innovative concepts to present through our prototypes. Concepts could become reality for future older people. Prototypes need to be integrated in pilot scenarios to prove their utility. Social science and psychology experts should guide us during this kind of trials. We are interested in building strong collaborations with other members of the Research Community.

Intelligent Home Services Living Laboratory

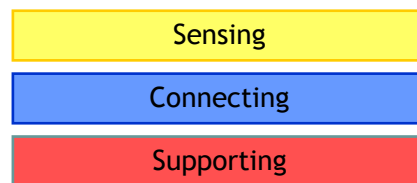
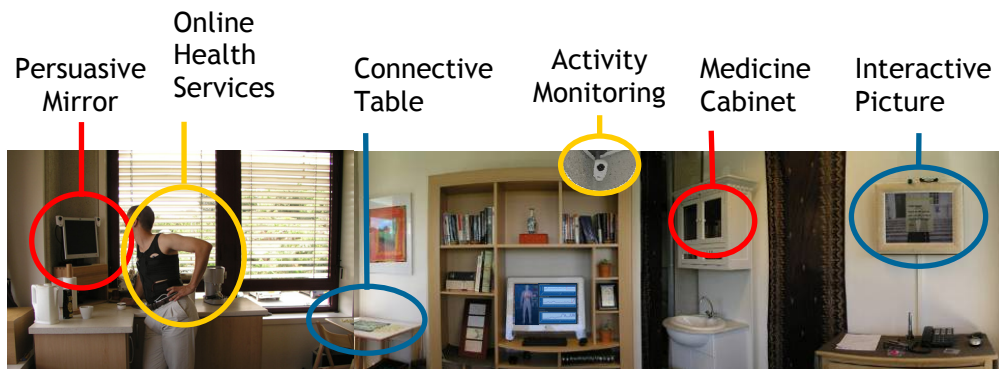


FIGURE 1: Intelligent Home Services Living Laboratory

REFERENCES

- [1] Accenture's Intelligent Home Services Initiative.(2005) <http://www.accenture.com/ihs>.
- [2] World Health Organization. (1948) Constitution. In Basic Documents, World Health Organization, Geneva.
- [3] Dahmani, S. (2004) Activity Monitoring. Intelligent Home Services. Accenture technology Labs Intern Report Sept.
- [4] WebMD.(2005) Web-based health coaching. Retrieved in 2005 from: <http://www.webmd.com/>
- [5] Iuvenalis, D.I. (60-127) Satire X, 356
- [6] Andrés del Valle, A. C. & Opalach A. (2005) The Persuasive Mirror: Computerized Persuasion for Healthy Living. In Proceedings of the 11th International Conference on Human-Computer Interaction (HCI International'05) Las Vegas, July 2005.