Intelligent home services initiative

As a global ICT service provider, Accenture acknowledges that the demographic change towards a society where people over 65 will be the majority is inevitable in many industrialized countries[1]. It will affect businesses in a variety of ways, from their workforce to the type of services and products they offer to their clients. Accenture Technology Labs researchers create prototypes of such future offerings in order to anticipate and prepare reliable and scalable ICT services for the future society.

Our Intelligent Home Services initiative investigates the role of technology in prolonging the independence of older people who live at home. According to the World Health Organization, "*health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*"[2]. Based on this multidimensional definition and research results from prior art, the initiative looks at future senior home care from three perspectives: *Sensing* the older person's environment, enhancing their *Communication* with the external world and *Supporting* their daily activities to help them promote their own well-being.

In this contribution, we present a selection of our prototypes representative of our approach to Research and Development. Like concept cars, these early-stage applications demonstrate the possibilities technology offers to create new service delivery options and business capabilities. Through these projects, we hope to generate healthy debates among key stakeholders regarding the future of elderly care.

Sensing

With broadband connectivity, wireless sensor networks, and a wide range of consumer health electronics available in homes, continuous health monitoring becomes possible while patients are away from a care facility. The *Activity Monitoring* prototype combines data provided by a network of cameras to continuously track older people's location in their environment, provide a log of activities (e.g., eating, sleeping or sitting) and detect potential falls (center of gravity of the person detected below a certain threshold above the ground). Although cameras are often considered intrusive, they provide richer information than presence sensors, offer finer granularity, but do not necessarily imply that images recorded in such private environments will be shared with the outside world: caregivers receive SMS alerts with high level warnings when a problem is suspected.

The *Online Health Services* prototype collects physiological data using a wearable set of sensors[3]. Similarly, high level alerts are generated when a combina-

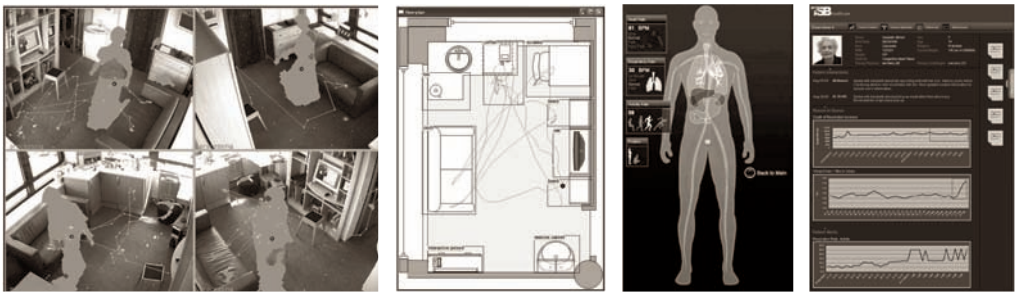

Figure 1. Activity Monitoring: A tracked person (far left) and a motion pattern (center left). Online Health Services: Current physiological state (center right) and over time statistics (far right)

Figure 2. Connective Tables: this advanced interface allows the older person to share lively activities with remote interlocutors in a natural way, for instance, playing Scrabble

tion of physiological data may indicate early signs of a problem. For example, strained respiration accompanied by a slight weight gain may announce congestive heart failure. In both prototypes, high level reasoning is applied to the data provided by the sensors, making it possible to generate information and alerts with a greater insight than what is proposed by today's telecare.

Communicating

Strong communication ties between the older person and the outside world could prevent problems, alleviate isolation and help the older person in times of distress and depression. Current advanced communication technologies such as email, videophones, or videoconference help the elderly strengthen the link with their families who live remotely, but they limit interaction to one-to-one conversations, which are not necessarily the best channel of expression for children or teenagers. The *Connective Tables* prototype consists of two remote tables, augmented with overhead cameras and projectors. Objects sensed at one end are projected on the other end, enabling two distant users to feel like they sit together and share the same physical experience. To understand the technical challenge of such setting, we created a remote Scrabble game. Gaming is one of the social activities that older people enjoy the most, and it is popular across generations. The system is able to detect the tiles on the board in one location and project them onto a board at the other end of the communication link. The Connective Tables work through a videoconference system for having conversations about the game.

Supporting

Older people gain autonomy and independence controlling their own well-being. With age, diet constraints increase due to high cholesterol level, obesity, diabetes and other conditions. To encourage people to maintain a healthy lifestyle, we designed an electronic mirror that 'knows' the person's behavior with relation to their goals and gives the user feedback rewarding positive and discouraging negative behavior. The *Persuasive Mirror* prototype is an augmented digital mirror using two cameras placed on two sides of a screen. The prototype discourages unhealthy eating and provides suggestions on a healthy diet. Users can ask for a summary of their progress (the amount of activity during the past months and their weight change) and get the resulting visual forecast of their appearance: if progress was made, the mirror shows images of past reflections so that users are conscious of the improvement (positive reinforcement

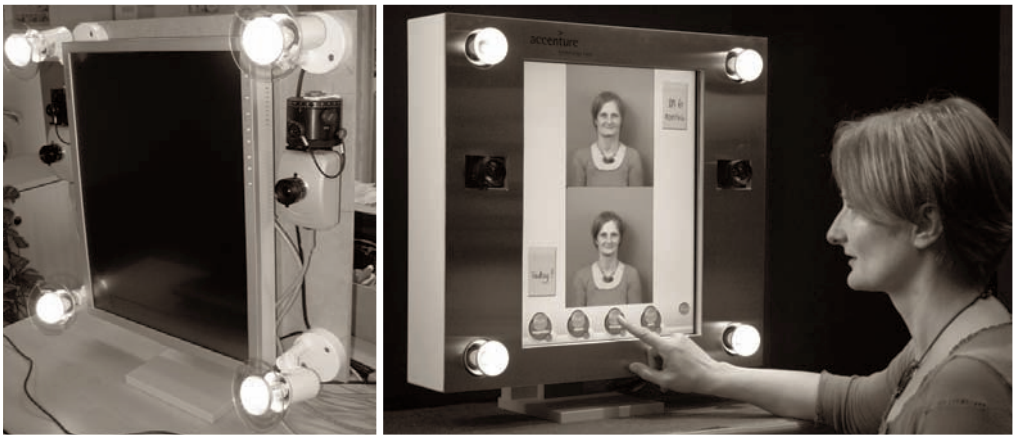

Figure 3. Persuasive Mirror: Visual feedback as motivation for behaviour change. Inside components (left) and usage scenario (right)

strategy); if they have been "misbehaving" the mirror displays the forecasted results (e.g., weight gain) of unhealthy eating (punishment strategy).

Discussion

The objective of our research is to explore how the latest advances in ubiquitous computing can enable new services and interactions beyond what is available today. The prototypes presented in this article describe three innovative applications to help older people improve their quality of life and peace of mind. Results obtained at Accenture Technology Labs demonstrate the technical feasibility for the three concepts described. Besides the technological challenges, there are still many open issues that have to be analyzed. These new applications will find a large market only if viable business models exist for the use of these technologies and if public acceptance is achieved. Barriers that may prevent the acceptance of these technologies include reliability, liability and privacy issues. Benefits of these technologies need to be quantified, and balanced against potential inconveniences. The technologies need to be evaluated by target users with regard to the various issues described above: are the technologies proposed ethical in the minds of the users? Would they be useful in the context of the users' daily life? Are they attractive and easy-to-use? What price are users prepared to pay for the service provided? This type of study requires expertise in areas such as economics, sociology or ergonomics that is beyond the competences of Accenture Technology Labs and is therefore sought through collaborations with experts. For example, we are currently working with an American university to include the persuasive mirror technology in a medical study on how to prevent obesity in adolescents.

References

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