An Approach to the Development of Technology to Empower the Elderly

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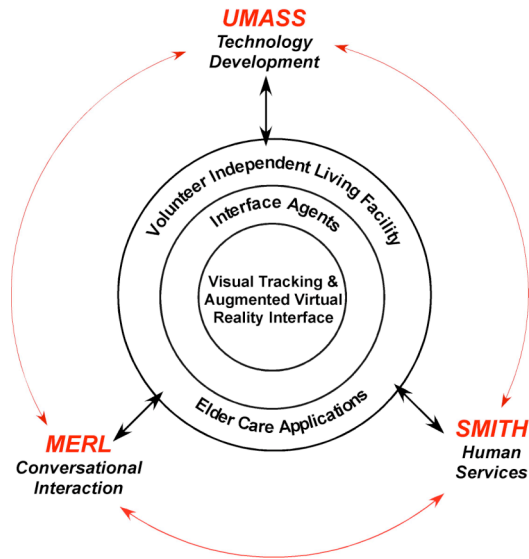**Smith School of Social Work, Smith College**

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The growing numbers of elderly individuals in need of support to live in the community will severely test the current services infrastructure. Part of the answer is to develop technological innovations that allow an elder population to successfully "age in place" with dignity and a sense of involvement with their community. However, we believe that it is essential to understand the needs of the target community through interdisciplinary perspectives of social science and computer science in partnership with potential elderly recipients of the technology themselves. Our team of researchers brings together social scientists and geriatric social work practitioners from Smith College and computer scientists who have expertise in computer vision, robotics, augmented and virtual reality, and intelligent user interfaces from the University of Massachussetts and Mitsubishi Electrical Research Laboratory (MERL).

We believe that those who develop assistive technology should be sufficiently involved at the "ground level" with the elders themselves, their families, caregivers and service systems. Active collaboration between social scientists and computer scientists can be increased significantly. Social science can tap into the theoretical foundations of behavior and identify those issues that are likely to facilitate and obstruct the introduction of assistive technology to the elderly, while technologists can provide the hardware, software, and environments to test promising ideas and provide dynamic feedback into the analysis.

The focus of this technology is to improve the lives of seniors by motivating them through empathetic and empowering interaction in such matters as improving their self care, and providing new ways to connect them to their social care network, families, friends, and the community outside their own dwellings. An ecosystemic perspective (Bronfenbrenner, 1979] is particularly useful when a study crosses disciplinary boundaries or attempts to draw upon disparate research traditions. It provides a broad framework that encompasses all other areas we plan to discuss. Empowerment and control are key goals of ecosystemic study and practice with a focus on identification of those interventions that enhance capacity [Abramson, 1978, Solie (2004].

Given such a need for flexible experimentation, we believe the research would greatly benefit from a chameleon-like system, one whose face changes as necessary according to the needs of the research. Thus, we are developing a reconfigurable system, called the Client Care Sandbox System (see figure), from a set of core technologies: intelligent user interfaces [Rich 1998, 2001, 2005] distributed sensor networks Karuppiah 2001, 2005] and augmented virtually reality [Ou,.2004]. It will allow social scientists and the elderly to "play" with and evaluate the application of these new technologies, with their findings informing the next generation of services. The interface agents allow us to fairly easily construct highly customized and user-centric views of the system for each application. This reconfigurability of the sandbox modules allows us to explore solutions to a diverse set of needs for aging in place, such as dealing with scheduled events, meal preparation, remote immersive communication, finding objects, etc.

UMASS
Technology Development

Volunteer Independent Living Facility

Interface Agents

Visual Tracking &
Augmented Virtual
Reality Interface

Elder Care Applications

MERL
Conversational Interaction

SMITH
Human Services

The Client Care Sandbox. We are developing a reconfigurable system designed to facilitate research into elder support applications. The sandbox is based on a set of component technologies wrapped with a set of customized conversational agents that communicate with the user in the context of specific needs.

References

[Abramson 1978] Abramson, L., M.E.P. Seligman & J. Teasdale. (1978). Learned helplessness in humans: Critique and reformulation. *Journal of Abnormal Psychology, 87*, 49-74.

[Bronfenbrenner, 1979] Bronfenbrenner, U. (1979). *Ecology of Human Development: Experiments by nature and design.* Cambridge MA: Harvard University Press.

[Karuppiah 2001] Karuppiah, D. R. Zhu, Z., Shenoy, R., and Riseman, E. (2001). A Fault-tolerant distributed vision system architecture for object tracking in a smart room, ICVS 2001, Vancouver, Canada.

[Karuppiah 2005] Karuppiah, D, forthcoming Ph.D. Dissertation, Computer Science Department, University of Massachusetts at Amherst

[Ou 2004Ou, S., Karuppiah, D.R., Fagg, A.H., Riseman, E. (2004). An Augmented Virtual Reality Interface for Assistive Monitoring of Smart Spaces. Proc. Second IEEE International Conference on Pervasive Computing and Communications, Orlando.

[Rich 1988] C. Rich and C. L. Sidner. Collagen: A Collaboration Manager for a Collaborative Interface Agent. User Modelling and User Assisted Interaction, Vol. 7, No. 3-4:315-350,   Kluwer Academic Publishers,1998.

[Rich 2001] Rich, C.; Sidner, C.L.; Lesh, N.B., "COLLAGEN: Applying Collaborative Discourse Theory to Human-Computer Interaction", Artificial Intelligence Magazine, Winter 2001 (Vol 22, Issue 4, pps 15-25).

[Rich 2005] Rich, C.; Sidner, C.; Lesh, N.; Garland, A.; Booth, S., "Collaborative Help for Networked Home Products", IEEE International Conference on Consumer Electronics (ICCE), January 2005.

[Solie (2004] Solie, D. (2004). *How to say it to seniors: Closing the communication gap with our elders.* NY: Prentice Hall Press