

## Chapter 23

# Augmented Reality Framework for the Socialization between Elderly People

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### ABSTRACT

*The socialization between elderly people assumes a key role on their mind and body well-being while loneliness expects to be one of major problems of our increasing age society. This research aims to study and develop a framework to support elderly people socialization when they are confined to their homes for some reason. It can be also adequate for people following some neurological or physical rehabilitation treatment remotely or monitoring behaviors in order to prevent potential diseases. This work proposes a framework that supports the socialization through Augmented Reality (AR) based on telepresence. The aim is a low cost solution that enables users to communicate and interact remotely, experiencing the benefits of a face-to-face meeting. The authors explore computers graphics, spatial audio, and artificial vision to induce sensations of being physical in the presence of other people and exploit the potential activities that such frameworks enable. TV and phones are elderly common companion devices that should be complementarily used with emergent AR technologies to enhance and create the remote presence feeling, minimizing the loneliness. Inspired by Virtual Reality (VR) studies, one of the authors' goals is to explore if VR presence measurement instruments are useful in the AR context by reviewing literature on the area.*

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## INTRODUCTION

Humans are noted for their desire to communicate each other. During most of their ages, this is an easy task due to their global mobility and ability to meet persons. When they become old, with less strength and mobility, they start becoming confined to their homes. Home elderly loneliness is a problem and the associated health problems are increasing health care costs (European, 2010). Phone's and Internet chat/audio/video conferencing programs (ex: VOIP, NetMeeting, Skype) have been used for socialization, nevertheless they are not able to create the remote person presence feeling. Therefore means of communications that enable eye contact, gestures, recognition, body language and facial expressions are required.

Augmented reality and particularly tele-immersion can provide the technology means that enables users interact remotely and experience the benefits of a face-to-face meeting (Azuma, Baillet, Behringer, Feiner, Julier, & MacIntyre, 2001) (Lanier, 2001). The tele-immersive technology combines virtual reality for rendering and display purpose, computer vision for image capturing and 3D reconstruction, and various networking techniques for transmitting data between remote sites in real-time with minimal delay (Kurillo, Vasudevan, Lobaton, & Bajcsy, 2008) (Petit, Lesage, Franco, Boyer, & Raffin, 2008) (Lien, Kurillo, & Bajcsy, 2007). Virtual meeting spaces allow the possibility of socialization, collaborative work on 3D data, 3DTV, remote training and monitoring, and remote teaching of physical activities (e.g., rehabilitation, dance) (Bailenson, Patel, Nielsen, Bajcsy, Jung, & Kurillo, 2008). By exploring computer graphics, spatial audio and artificial vision data acquisition techniques and we intend to induce sensations of being physical in the presence of other people (Almeida, Menezes, Seneviratne, & Dias, 2011). Stimulus control and consistency that support repetitive actions and real time performance feedback are some strengths of virtual

reality environments already used on rehabilitation (e.g. phobia treatments, motor exercises, elderly fall preventions) (Lange, et al., 2010) (Rizzo & Kim, 2005) (Riva, Mantovani, & Gaggioli, 2004) (Blascovich, Loomis, Beall, Swinth, Hoyt, & Bailenson, 2002) (Kurillo, Koritnik, Bajd, & Bajcsy, 2011) (Bohil, Alicea, & Biocca, 2011).

Concerning the rehabilitation task is strongly multidisciplinary, as it integrates different areas of video games, physical rehabilitation and computer vision. Its importance has already attracted the video game industry. With EyeToy, the gamers use the PlayStation 2's EyeToy camera to interact with objects on their TV screen in a "virtual" workout (the game puts the player into a game onscreen, representing an augmented virtuality example). Nintendo Wii video games have been used for physical therapy for patients after injuries and strokes in rehabilitation hospitals like the Sister Kenny Rehabilitation Institute in Minneapolis, USA (Rehabilitation, 2011). Several computerized systems for virtual rehabilitation are commercially available. In the cognitive domain virtual environment-based therapies are provided by companies such as Virtually Better (Atlanta GA), Lumosity Labs's (San Francisco, CA) and Nintendo DS Brain Age series. Game consoles are also currently being used in motor rehabilitation, with the Wii being the most popular game console adopted clinically. Cognitive games for the Wii train language (vocabulary) skills (My Word Coach) or memory and logic (Big Brain Academy) (Burdea, Rabin, Chaperon, & Hundal, 2011). The Wii game console is not appropriate for individuals challenged by arm gravity loading or with severe shoulder, elbow, or finger spasticity. It has been demonstrated that competition in the games makes them less boring and more motivating than traditional therapy. Microsoft recently launched Xbox Kinect controller-free games system as a response to Nintendo's extremely successful Wii enabling the user game interaction through gestures and body motion. Kinect Xbox 360 Fantastic Pets

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