

Enabling Social Interaction through Embodiment (ExCITE)

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Abstract The ExCITE project advocates robotic telepresence for elderly as a means to alleviate social isolation and to allow caregivers and relatives with little prior computer experience to virtually enter a home of an elderly and conduct a natural, secure visit just as if they were physically there. Within the project, the existing robot prototype is deployed to the targeted end-users, and is refined by tightly coupling the users and designers in the development cycles of the prototype throughout the project. In this regard, a rigorous evaluation procedure is deployed in situ, on a Pan European scale and with a longitudinal perspective. Key project ideas are (a) user centered product refinement, (b) user tests outside labs, in real contexts of use (c) use on a time period long enough to allow habituation and possible rejection to appear, (d) analysis of cultural and societal differences over European countries. A web portal for the project is at <http://www.excite-project.eu>.

Social interaction via a teleoperated robot

The elderly of today have the clear ambition of staying independent and maintaining the same level of **social interaction** throughout their lives. However the onset of the age related conditions for the vast majority is inevitable, and thus the decrease in both physical and mental health can impair mobility and contribute to a feeling of isolation, loneliness and depression. For a generation with basic or moderate exposure to Internet and mobile phones, Internet Communication Technologies (ICT) will have the potential to play a significant role in maintaining contact with others. Yet, for this to be possible, it is critical that such technologies meet the requirements for successful interaction between individuals and fulfill both the needs of elderly for achieving suitable social interaction as well as the needs of kin to be able to maintain contact.

Telepresence has long been advocated as a means to enable virtual face-to-face communications for people located at different places. A newer variant of telepresence that has recently emerged proposes to integrate ICT onto robotic platforms and enable actuation in remote locations. The use of such systems for the aging society as a tool to enhance social interaction for the elderly is still relatively novel. However, used as a device to increase social interaction, *robotic telepresence* could be particularly suited to an elderly audience. In fact the elderly can interact with the robot in a natural and intuitive manner as little additional learning is required for the elderly. In addition the client connecting to the robot from a remote location gains a greater level of control by having the possibility to move in the environment, which is clearly not possible in desktop applications. Despite this potential, the existing systems which advocate better social interaction have only been subjected to either little or no end user validation with an elderly audience.

In the **AAL project ExCITE** we focus on evaluating user requirements for social interaction through robotic telepresence. The robotic system we use in the project is called **Giraff** and consists of a screen and web camera mounted on a simple robotic base that can be teleoperated. The figures above show examples of visits via the Giraff. In the first case, the Giraff is placed in the residence of the elderly and the requirements of the system are assessed from the point of view of the elderly interacting with the device when embodied by a family member, spouse or healthcare professional and from the point of view of the person connecting to the device. In the second case, an occupational therapist communicates with an elderly doing exercise at a day rehabilitation center.

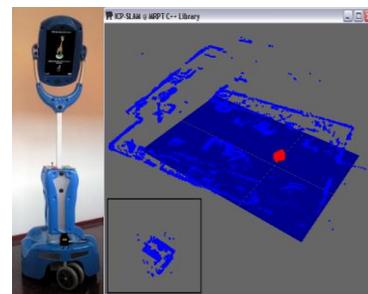


Evaluation and improvement of Giraff

Central to the project is the **long term evaluation** of Giraff that is achieved via long term test sites. In the

project 12 test sites will be set and maintained for one year. In the first phase of the project, we focused on providing the basic infrastructure to start the test sites. A complete evaluation procedure, based on qualitative and quantitative analysis has been designed for evaluating Giraff and its functionalities, considering different aspects of interaction with the users as well as the potential impact of Giraff on its users and their social interaction. The output of the user evaluation has been the basis of numerous technical, functional and aesthetic improvements of Giraff. We have also started 2 test sites in each of the three involved countries (Italy, Spain and Sweden) and we are collecting user data for a thorough evaluation of the system. The figures above show two of the test sites. In addition we have collected immediate feedback from users (both end users and client) on Giraff, involving also different types of potential client users, including formal caregivers like nurses and operators of several organizations. The procedure used often entailed a practical session with the interested users. After the practical sessions, different alternative methods were used to gather feedback on the above mentioned metrics: focus groups, interview, and questionnaires. This evaluation has provided directives that can be used for quick improvements of the technology and to add functionalities to the system.

Technical improvements of the actual platform and the pilot software have been implemented following recommendations of the users and to overcome the technical difficulties encountered in long term tests and include the introduction of a database management system for users called Sentry and a remote control to initiate calls. Sentry allows care organizations to manage Giraffs and users within their own domain and enables the creation of Giraff identities, permissions between users and Giraffs and assigning of a callout user for each Giraff. This not only facilitates the working of the test site during the course of ExCITE, but is a long term improvement that is part of the Giraff solution. The Sentry was further a response to a raised concern among elderly and caregivers, namely the need to be able to decide who is to have access to the Giraff and under what premises. A new remote controller was implemented that allows the elderly to call a pre-selected client user (call out user) but also to respond to or deny a call. The new remote is now under testing and will be further improved according to the feedback of the users. The physical appearance of the Giraff has also changed over time following user input. The latest version of the Giraff is shown above and a previous version is shown in the previous figure.



More complex changes to the platform are also implemented and focus on **improvement in the mobility** of Giraff. The implementation of semi-autonomous navigation for Giraff is on-going. Furthermore, the map building task which aims to obtain a 2-dimensional representation of the user's apartment is almost completed (see figure above). Remaining is software for producing a schematic map easier to use within the Giraff interface. The problem of recovering the Internet connection when the Giraff gets into areas with a poor Wi-Fi signal intensity has also been analyzed.

From a **commercialization perspective**, the main goal of the project over the next year is to initiate the first proactive marketing efforts for Giraff. These efforts will focus on the municipality, specifically on the social care organization and we expect a dramatically reshape of the current thinking on how the Giraff should be sold. It is possible that the Giraff will ultimately not be a single product, but rather a comprehensive service for social connection, integrating hardware, software, a "crowd sourced" knowledge base and online user forums that bridge the gap between Giraff as an interesting technology and Giraff as a valuable solution for home care.

In the first year the ground work has been laid for the cyclic evaluation and the first round of the cycle was completed. The **next two years** will delimit the ExCITE project from other initiatives for prototype evaluation in that we will study in particular (1) the longitudinal effects of deploying the Giraff to the test sites and (2) the scalability of running in parallel a large number of test sites across Europe with a prototype that is still relatively in its early developmental phase. Many of the technical difficulties which arise from practical implementation of new technologies have been addressed in the first cycle. The following two years allow for a more in depth study on many of the issues central to ambient assisted living, such as how to engage the organizations in order to encourage the uptake of this solution and how the use of the new technologies change over time and affect parameters such as loneliness and social isolation. We expect that the results obtained from the cyclic evaluations with Giraff will be able to in part generalize to new technologies and offer insights on the process of deploying new technologies for independent living in the European market.