

# Using virtual users to develop accessible ICT-based applications

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Smart Home Living Lab - ETSIT UPM. / LifeSTech

A tool developed by researchers from UPM allows us to assess usability during the design and testing process of accessible ICT-based applications.

Researchers from Universidad Politécnica de Madrid (UPM), led by María Fernanda Cabrera-Umpiérrez, have developed a set of parametric cognitive virtual models of users with disabilities that can be used to simulate the user interaction with Information and communications technology (ICT) applications. This simulation will allow researchers to

develop more efficient and accessible ICT applications for people with functional limitations and disabilities.

Despite the speedy evolution of ICTs and the growing recognition of the importance of the concept of universal design in all domains of daily living, mainstream ICT-based product designers and developers still work without any truly structured tools, guidance or support to effectively adapt their products and services to users' real needs. In an attempt to improve this situation, researchers from Life Supporting Technologies group (LifeSTech) have carried out a research within the framework of VERITAS European project.

Firstly, researchers identified the main cognitive functions and their corresponding parameters that are relevant to each type of [cognitive impairment](#) of interest (Alzheimer's disease patients, Parkinson's disease patients, and people with visual, hearing and speech impairments).

Secondly, this data was classified by using ACT-R cognitive architecture which interrelates how people perform tasks with the parameters that define their cognitive functions. Additionally, specific needs of end users and recommendations, such as guidelines and parameters that support the developer decisions during the design process, were included in the models.

In order to verify these models, researchers from LifeSTech carried out the accessibility evaluation of a real health monitoring system. Thus, three potential user groups were simulated: with age-related cognitive decline, with visual impairments and with motor disabilities. Results show that the developed parametric cognitive virtual models of users are a virtual representation similar to real users who are affected by functional limitations, age-related cognitive decline and disabilities.

These models are also a useful tool to assess the usability of applications

throughout all stages of the development process in order to guarantee the maximum level of accessibility and interaction, as well as to carry out improvements before testing with real and potential users in real or simulated environments.

This study is part of a research line that aims to develop ICT-based applications for users with cognitive impairment caused by chronic illnesses or disabilities.

According to María Fernanda Cabrera-Umpiérrez, a researcher from LifeSTech group, 'We are also working with virtual reality to develop cognitive trainings for patients with [mild cognitive impairment](#) (MCI) and early stages of Alzheimer's disease. These [cognitive](#) trainings are based on games for Parkinson's patients and computerized tools based on sensors to carry out therapies for people with apraxia which is a disorder of the nervous system characterized by an inability to perform purposeful movements.

**More information:** Rebeca García-Betances et al. Parametric Cognitive Modeling of Information and Computer Technology Usage by People with Aging- and Disability-Derived Functional Impairments, *Sensors* (2016). [DOI: 10.3390/s16020266](https://doi.org/10.3390/s16020266)

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