

Carinthia University of Applied Sciences – AAL Research

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Abstract: Anchored to the Carinthia University of Applied Science, (computer) engineering researchers incorporate to improve daily living for elderly people. This paper gives an overview of the Active and Assisted Living research emphases. Embedded in an engineering and IT department (area of studies medical engineering / research unit Active & Assisted Living) one part is implementing and evaluating technology and, furthermore, in an interdisciplinary infrastructure (Institute of Applied Research on Ageing) technological, economic and social aspects of aging are focused. The portfolio has different evaluation and requirement analysis methods as well as software conceptualization and development - always with a strong focus on user involvement.

Keywords: Active and Assisted Living, AAL, User Experience, Smart Home, User Interaction, Smart Living, Smart Health, Telemonitoring

1 Introduction

To advance research, development and innovation processes at Carinthia University of Applied Sciences (CUAS) different research units and research institutes with special research focus were established. Scientists, consolidated from different technical and non-technical professions, work together on the topic of research, development and anchoring of new processes, concepts, technical solutions and integrated services for ageing well. This research is performed in the “Research Unit Active & Assisted Living (RUAAL)”. In the “Institute for Applied Research on Ageing (IARA)”, which is a consolidation of the technique department “Health and Assistive Technologies (HAT)”, the social department “Intergenerational Solidarity, Activity and Civil Society (ISAC)” and the economy department “Demographic Change and Regional Development (DCRD)” interdisciplinary research is realized. In this paper, the focus is set on the research topics in RUAAL and the HAT department of IARA.

research group is involved in different national and international research projects as lead or project partner with a focus on technique conceptualization and development, technology-related evaluation such as technology acceptance, user experience or usage analysis as well as projects with a strong focus on strategic network-building and transnational knowledge exchange.

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2 Research fields of RUAAL

The research unit AAL, established in 2018 [KRA17] aims to develop concepts, products and services to connect technologies and the social environment with one another and thereby make a positive contribution to increasing the quality of life in old age as well as all phases of life. Basis for applied research is a Living Lab R&D&I approach that includes methods, processes, infrastructure and partnerships for the realization of cooperative, applied research (ideation, conception, validation and testing, evaluation) of technical products, services, concepts in the context of AAL.

2.1 Smart Home / Smart Living Applications (- Environments)

Technical innovations with an emphasis on Smart Home / Smart Living focus on intelligent living with interconnected sensors, actuators, and IoT technologies. The main emphasis is the situation-adaptive, modular and interoperable implementation, integration and evaluation of smart sensors as well as the development of interoperable interfaces and AAL-IoT layers. A further content-related emphasis of the RUAAL is the development of algorithms for the recognition of activities of daily living (ADLs) describing parameters (sensor based) as an indicator for changes in the daily living routines; e.g. monitored changes of health conditions over a longer period.

2.2 Smart Health and Telemonitoring Applications

Health care, monitoring of health conditions as well as teleinterventions (medical support, rehabilitation) are especially in rural areas of major importance and are a core theme in the AAL Vision Austria 2025 [BLG18]. Applications with a (semi-) automatic acquisition, visualization, and transmission of vital parameter data are implemented. Furthermore, data from medical/therapeutic assessments are processed for experts to give skilled feedback to their clients. Every development is realized with a strong focus on privacy, security and safety issues and with respect on the Austrian DSGVO 2018 [EU18] as well as on the GTelG [OEB13] legislation.

2.3 Smart Interaction – User groups – and contextual universal User Interfaces

Besides the technology development in the other two emphases, it is important to conceptualize and evaluate an appropriate interface for the interaction of the users with technological solutions. The third emphasis is on the development, conceptualization, and evaluation of human-system interaction interfaces for AAL solutions and the evaluation of (new) interaction strategies to increase accessibility (universal design), to decrease usage barriers and to improve the user experience. To fulfill these tasks it is important to work together with the user groups in an iterative co-creation approach.

3 Living Lab Approach

Since 2013, the research group is working with the Living Lab approach. In the Living Lab PROLIDA (Professional Living, Innovation and Development Lab for an Ageing Society) supporting infrastructure and methodical approaches for accompanying research in projects as well as for commissioned research from business partners are provided.

3.1 Infrastructure

As part of the CUAS, PROLIDA includes the laboratory infrastructure provided and implemented over the years. Two laboratories are of special interest for the AAL research: the iADLlab and the UX lab. The iADL lab (instrumental activities of daily living lab) is a lab that contains a demo-apartment including kitchen, living room, bedroom, dining room, and bathroom. In that flat, it is possible to test different smart home sensor settings as well as it can be used as a networking place for different stakeholder groups. The UX lab (user experience lab) extends the possibilities of the iADL lab in a way that observations and different soft- and hardware tests according to UX concerns can be realized.

3.2 Methods

To support different project partners during technology development/evaluation, a set of different methodologies was implemented into the PROLIDA catalog of benefits. These methods cover the support from a project idea to the implementation of functional prototypes and the implementation of sustainability strategies. For a successful project start, it is possible to do a requirement analysis with user involvement to gather the needs of the addressed user groups. Another service is the software development from the conceptualization (functionality, design, interaction strategy) to a functional prototype. The provided UX methods are technology acceptance, usability evaluations, development of (online) surveys in a quantitative, qualitative and mixed characteristic; or in the form of standard surveys like TE-AG³, TUI⁴, AttrakDiff⁵, meCUE⁶, UEQ⁷, or SUMI⁸. Moreover, supporting methods like observations, interviews, workshops/focus groups and evaluation of software related to barrier-free design for different user groups are included in the set. The researchers are also constantly working on customized tools to improve the user involvement; e.g. an own interaction design diagram was developed

³ TA-EG survey: https://www.mms.tu-berlin.de/fileadmin/fg268/Forschung/TA-EG_Fragebogen_Technikaffinitaet.pdf

⁴ TUI survey: https://www.ffg.at/sites/default/files/allgemeine_downloads/thematische%20programme/programmdokumente/tui_manual.pdf

⁵ AttrakDiff survey: <http://attrakdiff.de/>

⁶ meCUE survey: <http://www.mecue.de/>

⁷ UEQ survey: <https://www.ueq-online.org/>

⁸ SUMI survey: <http://sumi.uxp.ie/>

that helps to get information from non-technical users about the understanding of navigation strategies of software [SKO18].

4 Best practice: Smart VitAALity

The AAL pilot region Smart VitAALity⁹ considers the aim of an adequate and technology-driven technology development, multi-dimensional evaluation (technology acceptance, usage analysis, user experience evaluation, socio-economical potential analysis, effectiveness analysis) as well as a derived sustainability strategy. In the project, an integrated AAL system in a smart-city-setting “health, inclusion and assisted living” will be evaluated with 230 elderly people (intervention and control group) in the province of Carinthia in the urban triangle Klagenfurt – Villach – Ferlach. The Smart VitAALity system combines different technology components to support elderly people during their daily living. The major goal is to increase the specific domains of quality of life of the target group. The technology package includes different (state of the art) communication- and information technology components e.g. a smartwatch and a tablet, smart home sensors as well as devices for vital parameter measuring. These technologies are provided in combination with accompanying services like a care center service to support the personal health monitoring process and to give the users feedback on their general health condition, or a call center to realize a 24/7 emergency call system to increase safety.

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⁹ Smart VitAALity Webseite: www.smart-vitaality.at