

I-CARE: Individual Activation of People with Dementia

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1 Motivation

Many developed countries see a dramatic demographic change. Their population is aging, the life expectancy increases while birthrate decreases. Since the risk of cognitive decline and dementia is drastically increasing with age, Europe expects that the amount of people developing dementia over the next 20 years will double every 5 years. Consequently, the demand of care is substantially growing and expected to be provided by professional as well as informal carers.

We are convinced that technical systems are very suitable to tackle some of the oncoming challenges. Unfortunately, the number of technical systems available for care of people with dementia is still rather limited [1]. Intelligent technical systems that automatically adapt to biographic information, details of past sessions and online recorded sensor signals may allow highly individualized therapy concepts. Such systems could relieve professional as well as informal carers.

The recently started project I-CARE* with seven interdisciplinary partners in academia and industry as well as social services aims at the development of technical innovations in human-computer interaction to support the care of people with dementia in our aging society. In particular, I-CARE focuses on technical support to ease the burden on relatives and professional carers. This is envisioned to be achieved by an adaptive and mobile technical system, which activates and promotes individual cognitive, social, and motor skills.

* I-CARE project homepage, <https://www.projekt-i-care.de>

2 The I-CARE System

We envision the adaptive and mobile I-CARE system, that learns about the individual needs and potentials of people with dementia and facilitates the building of ad-hoc activation groups. The I-CARE system will provide individualized activation content to informal caregivers by analyzing individual activation needs, potentials and daily condition of people with dementia.

I-CARE will be equipped with a *recommender* system, which preselects and suggests a small subset of appropriate items. These suggestions are learned based on explicit or implicit preferences, i.e. individual biographic information, graphical and voice-based ratings made by the user, stress, emotions, or other behavioral user reactions. At deployment, the recommender system has no interaction history for any user, thus preferences are unknown. For proper initialization, information are taken from biographic data, thus semantic similarity [3] and item similarity will be employed.

The system runs on a tablet computer with a straight-forward, easy to use, and intuitive user interface. The tablet camera will be applied for face detection and the identification of emotions from facial expressions, while the microphone allows for voice activity and emotion analysis. In addition to the tablet, users will be equipped with an unobtrusive wrist band. The device measures motion based on inertial sensors, electrodermal activity (EDA) and the cardiac signal, i.e. heart rate (HR) and heart rate variability (HRV). While the first will be applied to interpret the user's physical activities, the latter two will serve to differentiate stressful from relaxing situations [4] during an activation session. By combining the information from the tablet and wrist device, we hope to obtain detailed information on the affective state and engagement of users. Among others, this information will also be applied to the recommender system as implicit rating.

Acknowledgments: The project I-CARE "Individuelle Aktivierung von Menschen mit Demenz" is funded by the Federal Ministry of Education and Research (BMBF) within the research programme "IKT 2020 - Forschung für Innovationen" as joint project under the reference number V4PID062.

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