Defining affective Identities in elderly Nursing Home residents for the design of an emotionally intelligent cognitive assistant

Alexandra König
Computational Health Informatics Laboratory,
University of Waterloo, Canada
Tel.: +1 226-989-3676
a.konig@uwaterloo.ca

Linda E. Francis
Department of Sociology and Criminology, Cleveland State University, USA
l.e.francis@csuohio.edu

Aarti Malhotra
Computational Health Informatics Laboratory,
University of Waterloo, Canada
aarti.malhotra@uwaterloo.ca

Jesse Hoey
Computational Health Informatics Laboratory,
University of Waterloo, Canada
jhoey@cs.uwaterloo.ca

Abstract

In this paper, we describe the first outcomes of the ACT@HOME research project which aims to develop an emotionally intelligent cognitive assistant (ICA) to engage and help older adults with Alzheimer's disease (AD) to complete activities of daily living (ADL) more independently. To accomplish this, we carried out semi-structured qualitative interviews with elderly nursing home residents in order to define their different affective identities, personalities and backgrounds. For this, a specific new interview tool was designed based on the principles of Affect Control Theory (ACT), a socio-cultural theory of affective interactions. The ICA will be programmed then to learn the different extracted affective identities (i.e., "personality") of a person during an interaction, and will tailor prompts to specific individual's needs' in a way that ensures smoother and more effective uptake and response. Preliminary results of the first analysis of the interviews show that we can distinguish clearly between certain affective identities, such as for instance 'the depressed lawyer', or the 'independent athlete' etc. and thus, define their resulting preferences in a specific prompting style provided by the ICA.

Author Keywords

Qualitative interviews; affective computing, Intelligent interactive systems; virtual assistant; prompting; support in ADL; elderly care; dementia.

ACM Classification Keywords

Human-centered computing → Interaction design → Interaction design process and methods →User studies

Introduction

It has been found that the artificially intelligent cognitive assistant (COACH) which assists older adults with Alzheimer's disease (AD) during activities of daily living (ADL) by monitoring the person and providing audio-visual cues when the person stops making progress [1], works very well in practice in some cases [2]. However, for some persons, the COACH fails to provide appropriate assistance, and we believe this is mainly due to an affective (emotional) misalignment of the COACH with the specific needs of the individuals.

Considering the heterogeneity in socio-cultural and personal affective identities, a primary reason for lack of effectiveness may be the static, non-adaptive nature of the "canned" (pre-programmed) prompts. We aim to define different affective identities extracted from qualitative interviews with the end-users and integrate them into the existing cognitive assistant, in order to improve the overall (cross-individual) effectiveness and potential uptake of such systems.

Methodology

A semi-structured interview tool was designed questioning elderly residents of a nursing home as well as their caregivers. The nursing home residents are diagnosed with mild to moderate dementia while their caregivers are healthy but command over long-term experiences with the residents.

Questionnaires

All questions of the semi-structured questionnaire were open-ended and phrased conversationally, to allow maximum flexibility in accommodating the needs of respondents and in order to consider concepts not known beforehand. The questionnaire sought to elicit demographic and role related parameters and in order to assess the participant's identity, the questionnaire asked questions about life domains (family and origin, occupation/vocation, personal history such as immigration or military service, and relationships associated with strong feelings such as traumatic or deeply romantic ones).The categories of identities were based on structural approaches to identity [3], using some of the most common domains of identity: family, work, and networks. This strategy imposed some degree of direction to the interview. However, the interview also drew on identity work related to ACT [4], which argues that a person's identities represent that individual's historical biography, and thus are subject to change and development as the person's situation changes. Thus the questions were kept general, with a historical focus to encourage better recall among elders with dementia, but also allowing for current changes. In a next step, the transcriptions are analyzed in order to identify profiles of affective identities and personalities in this population as well as their emotional content. The results of the analysis will lead into coding into numerical 'affect control' profiles to which the ICA will learn to provide the appropriate response. The coding of the interviews is done using the EPA rating scale (Figure 1. [4]) Each rating scale presents adjectives at its end points in order to describe the negative and positive poles of the dimension (Evaluation, Potency and Activation). The custom is to use plus units to measure goodness, powerfulness, and liveliness; minus

Resident R1, that is coded as slightly powerless, bad and inactive since the extracted affective identities were 'young demented', 'former lawyer' and 'depressed', an adapted prompting style would be 'stimulating – uplifting – positive – instructive'.
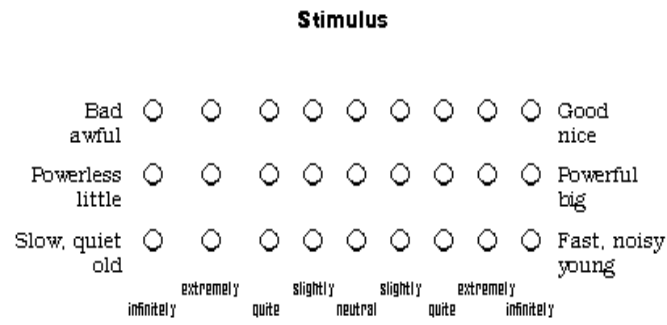
Interview Quote R1: "…yea, I have three kids. No, two kids (…) yea my family comes here to visit…well..not often enough but, (…). I was a lawyer. did you like your job as a lawyer? umm..Not that much.…it was..the council must be very important…I retired from the city of XX when it became parented I was suffering from..umm….Alzheimer's?.. yea maybe.."

Resident R4 is coded as slightly good, extremely powerful and active due to the extracted identities 'athlete', 'career' and 'independent', an adapted prompting style would be 'minimalistic', 'neutral' and 'calm'

Interview Quote R4: "…I was a former athlete…it was always exercising…it was very important for me and helps me not to lose my mind (…) I want to stay fit…I needed to so that I could take care of my husband when he got sick (…) .I needed to be strong…I never want to depend on anyone…I manage well by myself…I don't need help…"

units for bad, powerless, or quiet. Ratings are converted into numbers depending on which position is marked.

Figure 1
Scales for measuring Evaluation, Potency, Activity

-4	-3	-2	-1	0	+1	+2	+3	+4

For example, something that you rate as "quite good, nice" gets coded +2 on Evaluation

Participants
7 interviews have been already carried out and analyzed. Each interview session, of approx. 45 min is recorded and carried out by a trained psychologist. Inclusion criteria for the residents are to be over the age of 50 years; fluent in English; to hear normal levels of speech, cognitive impairment and impairment in initiating and performing sequences of ADL steps.

Results
Preliminary results of the analysis of the first sample of 7 interviews show that we can distinguish clearly between certain affective identities, for instance 'the depressed lawyer', or the 'independent athlete' etc. in this population and thus, define their resulting

preferences in a specific prompting style provided by the ICA. Interestingly, we achieved with this new tool to extract for each participant its own personal set of affective identities and concurrently we can detect similar behavioral patterns and personality profiles. After analyzing the transcripts, the identities were extracted and preliminary coded in EPA numerical profiles as shown in Table 1 .For each profile, a specific prompting style for the ICA to adopt is suggested aligned with the affective profile of the end user. The suggested prompting style should lead to better engage the elderly with the ICA and thus, adhere to more prompts since it targets their personal affective state. It has to be underlined that these are only sample results of preliminary coding and a full analysis will be profile ratings will be drawn from established ACT dictionaries of all affective identities-related terms gathered and collected from researchers in Canada [5]. An extensive overview of these analysis results will be presented in detail at the conference and build the basis for the further development of the novel ICA.

Discussion
The technology and trial findings from this research, thus the different defined affective identities, will continue to progress towards achieving the long-term goal of assisted technology to support older adults with dementia. This will be accomplished through continuing with the expansion of the system to other ADL, more permanent in-home installations, and longer term studies of using this technology. We will also seek out an industrial partner to ensure transfer of the resulting technologies to the market. Our results will have extrinsic merit as they will have a significant impact not only on the AD field and smart home systems, but also in the affective computing field.

Residents	EPA Configuration	Affective Identities	ICA Prompts
R1	Slightly bad, slightly powerless, slightly inactive E: -1 ; P: -1 ; A: -1	Young demented, lawyer, depressed, father	Slightly Stimulating, positive, uplifting, instructive
R2	Quite good, slightly powerful, slightly active E:+2 ;P:+1 ;A: +1	Protector, salesman, Carrier, Lover	Neutral, Calm, charming,
R3	Slightly bad, extremely powerless, extremely inactive E: -1 ; P: -3 ; A: -3	Confused, Immigrant, Lost	Stimulatingvery friendly, educative, guiding,
R4	Slightly good, extremely powerful, extremely active E: +1, P: +3,A: +3	Athlete, Helper, Independent	Minimal, neutral, quiet
R5	Quite good, slightly powerless, slightly inactive E:+2, P: -1, A: -1	Mother, Pacifist, Church goer	Neutral, Calme, friendly, guiding
R6	Quite good, quite powerful, quite active E:+ 2, P:+2, A: +2	Reverend, Helper, Father	Neutral, friendly, quiet
R7	Quite bad, extremely powerful, extremely active E: -2, P: +2, A: +2	Researcher, Provoker, Free spirit, Bipolar	Positive, friendly, minimal,

Table 1. Extracted affective identities

References
1. A. Mihailidis, J. Boger, T. Craig, and J. Hoey, *The COACH prompting system to assist older adults with dementia through handwashing: An efficacy study*, BMC Geriatrics, vol. 8, 2008.

2. Rozanne Wilson, Elizabeth Rochon, Alex Mihailidis, and Carol Leonard. 2012. *Examining Success of Communication Strategies Used by Formal Caregivers Assisting Individuals With Alzheimer's Disease During an Activity of Daily Living*. Journal of Speech, Language, and Hearing Research 55 (April 2012), 328–341

3. Merolla, David M., Richard T. Serpe, Sheldon Stryker, and P. Wesley Schultz. 2012. *Structural precursors to identity processes: The role of proximate social structures*. Social Psychology Quarterly 75: 149-172.

4. Heise, David R. and MacKinnon, Neil J. (2010). Self, Identity, and Social Institutions. New York: Palgrave McMillan

5. MacKinnon, Neil J. Mean Affective Ratings of 2,294 Concepts by Guelph University Undergraduates, Ontario, Canada, in 2001-3 [Computer file]. Distributed at Affect Control Theory Website, Program Interact
<http://www.indiana.edu/~socpsy/ACT/interact/Java Interact.html