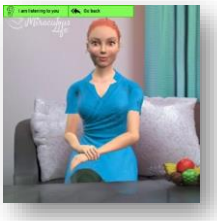
Miraculous-Life

Daily life support at home through a virtual support partner

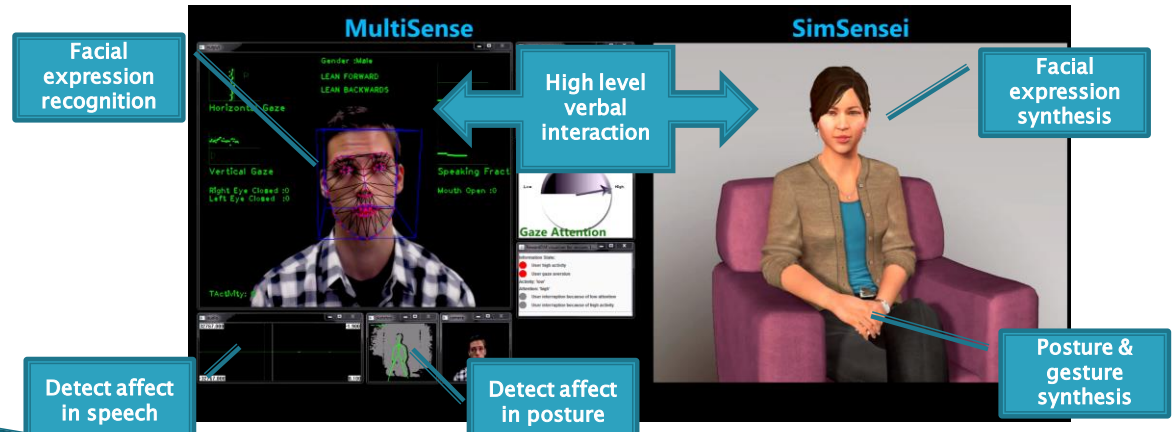


Sten Hanke (AIT)
www.miraculous-life.eu

AIT Austrian Institute of Technology · Université de Genève · zuyderland (Former Orbis Medisch en Zorgconcern) · Fraunhofer IGD · Noldus Information Technology · CiTARD Services Ltd · zoobe say it with character. · MR PS

EMBODIED CONVERSATIONAL AGENTS

HUMAN-LIKE CAPABILITIES OF INTERACTION



DeVault, et al., SimSensei: A Virtual Human Interviewer for Healthcare Decision Support. 13th International Conference on Autonomous Agents and Multiagent System

Background and Motivation

- Embodied Conversational Agents (ECAs) can improve interaction in AAL environments
- Older adults are capable of recognizing emotions in facial expressions of an agent and follow instructions better
- ECAs allow development of affinitive relationships / companionship
- Might contribute to reduce the feeling of loneliness
- Motivational aspect
  - Increased interactions and increase of activities / services usage
- Move beyond "computer as a tool"
  - Easy to use, engaging, trustful for older adults
- Miraculous-Life designs, develops and evaluates an innovative user-centric technological solution, the Virtual Support Partner (VSP), attending to the elder (65+) daily activity and safety needs, while the elder goes about his normal daily life

Miraculous-Life
Miraculous Life for elderly Independent Living (STREP No. 611421)

What Miraculous-Life offers

Components

I. Input devices
II. Multimodal processing
III. Reasoning and decision making
IV. ICT services
V. Output generator
VI. Knowledge base

5. Using 3D techniques for a 'real-human' avatar the elderly likes to see. + The avatar is emotionally responsive of the elderly

Adaptive Avatar installed in several rooms in the home of the elderly

1. Recognizes the emotional state of the elderly

4. Direct connection to formal and informal caregivers

3. Develop a dialogue model based on multiple contexts (linguistic, emotional, semantic, cognitive, physical)

2. Interpret the behaviour of the elderly considering environmental context

Emotional Responsiveness

- Miraculous-Life VSP → emotionally-enriched HCI
- Miraculous-Life VSP fuses together
  - Facial expressions (face reader)
  - Voice intonation (emotion from speech) + environmental context
  - Gestures
- 3 modes → listening, waiting, talking
- 4 emotional states recognised
  - Anger/disgust, fearful/stressful, sadness, happiness/positive
- 7 emotional states/expressions of avatar
  - Happy, sad, worried, relieved, compassionate (expresses sympathy), directive behaviour, and neutral (but VSP should not express negative emotions)
- Mapping is key and based on scientific (nursing science, health psychology) & domain knowledge
- Computational model of VSP emotions based on Roseman's model

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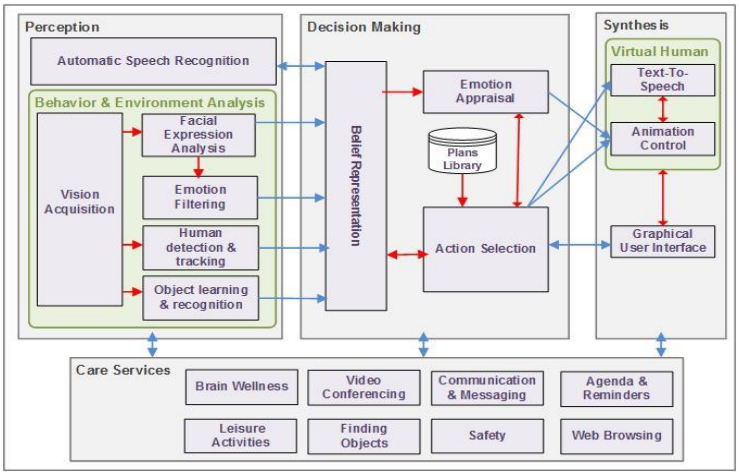
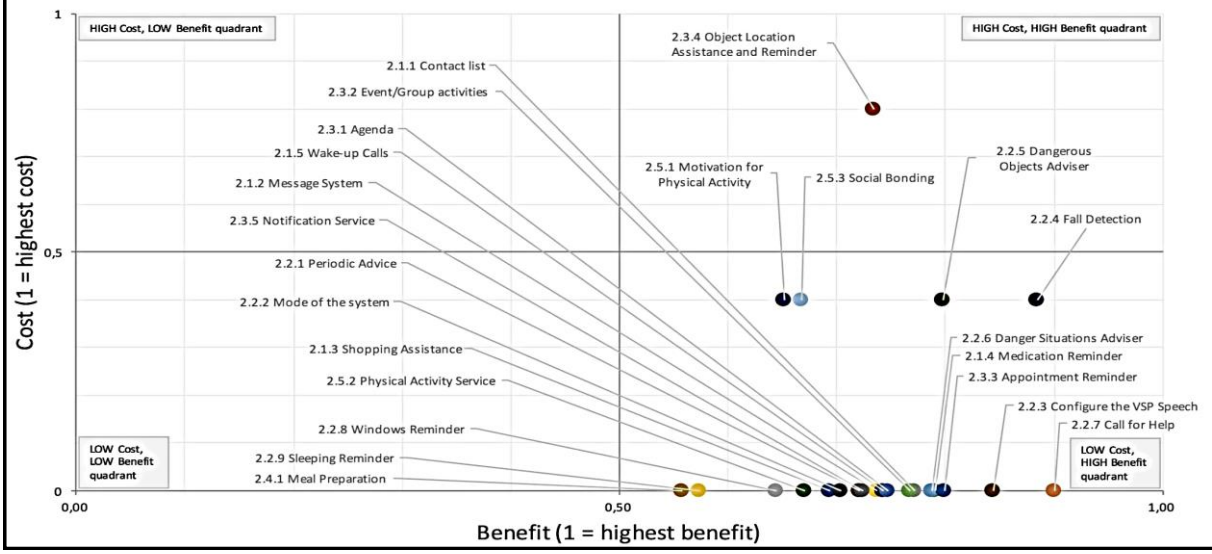
MODULAR COMPANION ARCHITECTURE

CORE MODULES REALIZING COMPANION CAPABILITIES



Services and Benefits



CONCEPTUAL DESIGN
KEY DESIGN GOALS FOR THE ASSISTIVE COMPANION

2 User- centered design studies

Social intelligence

- Sensitive to body language and spoken responses in the interaction
- Ask specific types of questions and follow-up dialogue
- Express appropriate behavioural nuances

Appearance

- Humanlike
- Informal look
- Adult, female

Care provision

- Socialization, Communication
- Daily activity organization, Mental wellness training
- Preventive Safety

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EVALUATION STUDY
DIALY LIFE ASSISTIVE COMPANION

Design opportunities and technical challenges in real world settings:

USER EXPERIENCE

How do older adults interact with a companion in their daily living environment ?

EFFICIENCY

How does an automated companion perform in a daily living environment ?

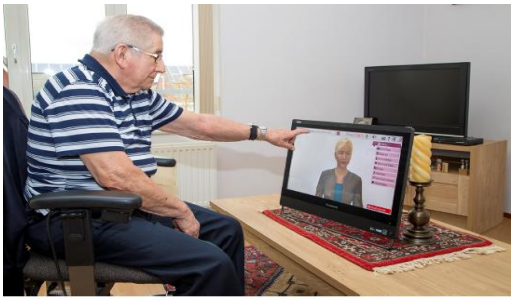

Photo: System set up in the apartment of an elderly user (The Netherlands)

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Findings and Outlook

- Three testing phases performed (seniors and caregivers)
- Final trials in NL (Zuyderland) / CH (MRPS) currently running (21 participants, av. age 85)
- Evaluate robustness of the prototypes and assess the users' acceptance
- Avatar as interface (with speech interaction) appreciated by elderly
- Service offers are key (avatar is mediator to the services)
- Speech/audio recognition still tricky in home environments
- Limitations in emotion recognition
  - Gestures (from older adults) give less information on emotional state → Activity recognition
- Recognition capabilities (objects, etc.) based on Kinect limited
- Potential to increase quality of life, prolong the autonomy of seniors and reduce the care stress will be further investigated
- System will be exploited as a stand-alone consumer product, operating on a scalable distributed network of interconnected PCs, tablets and Kinect devices

The project Miraculous-Life is co-funded by the 7th Framework Programme for Research and Technological Development of the European Commission, within the Call FP7-ICT-2013-10.

LESSONS LEARNED

How do older adults interact with a companion in their daily living environment ?

Attribution of sociality to the companion

- Older adults use human-like communication strategies

Attribution of human cognitive and emotional capacities to the companion

- Older adults have wrong expectations about the companion's abilities

Unexpected companion behavior may lead to user frustration

- Even if only a small part causes the frustration, it may affect the interaction as a whole

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LESSONS LEARNED

How does an automated companion perform in a daily living environment ?

Multimodal perception of non-verbal behaviours

- **Challenge:** Cope with residential environment restrictions – poor lighting conditions, ambient noise, user privacy
- **Consequence :** The companion perceives a small repertoire of non-verbal behaviours

Natural dialogue interaction

- **Challenge :** The automated understanding capabilities of the companion cannot cover the high variability in the vocabulary expressed by users
- **Consequence :** Simplifications in the dialogue flow

Simulating affective behaviour

- **Challenge :** Deep semantic understanding and domain knowledge is necessary to automatically generate authentic affective expressions
- **Consequence :** The companion generates a small repertoire of emotional reactions

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Thanks for your attention!

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