Une école en mouvement

Challenges in Running Long-Term, Multi-Site Studies with the Elderly in the ENRICHME Project

François Ferland

Roxana Agrigoroaie

Adriana Tapus

École Nationale Supérieure de **Techniques Avancées**

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ARMINES

ENSTA ParisTech université PARIS-SACLAY

Overview

- What is the ENRICHME project ?
- Arrising issues …
  - With the elderly
  - Between multiple sites in different countries
- How these issues affect results
- What can we do to mitigate them

The ENRICHME Project

- ENRICHME: **EN**abling **R**obot and assisted living environment for **I**ndependent **C**are and **H**ealth **M**onitoring of the **E**lderly
- A EU Horizon 2020 Project
- 8 partners, including 4 care facilities (Greece, Italy, Poland, UK)
- Aimed at assisting elderly people with Mild Cognitive Impairment (MCI) in their home.

The ENRICHME Project

- Uses 7 PAL Robotics TIAGo robots
- RGB-D and thermal cameras for physiological monitoring and activity recognition
- RFID antenna for locating tagged objects around the house
- Voice and touchscreen interaction modalities
- Connected to a smart home sensors network

(non-final version, arm will be replaced by a touchscreen)

The ENRICHME Project

- Reminders for health-related tasks (medecine intake, doctor appointments)
- Cognitive stimulation through intelligent games
- Telepresence platform for remote care givers

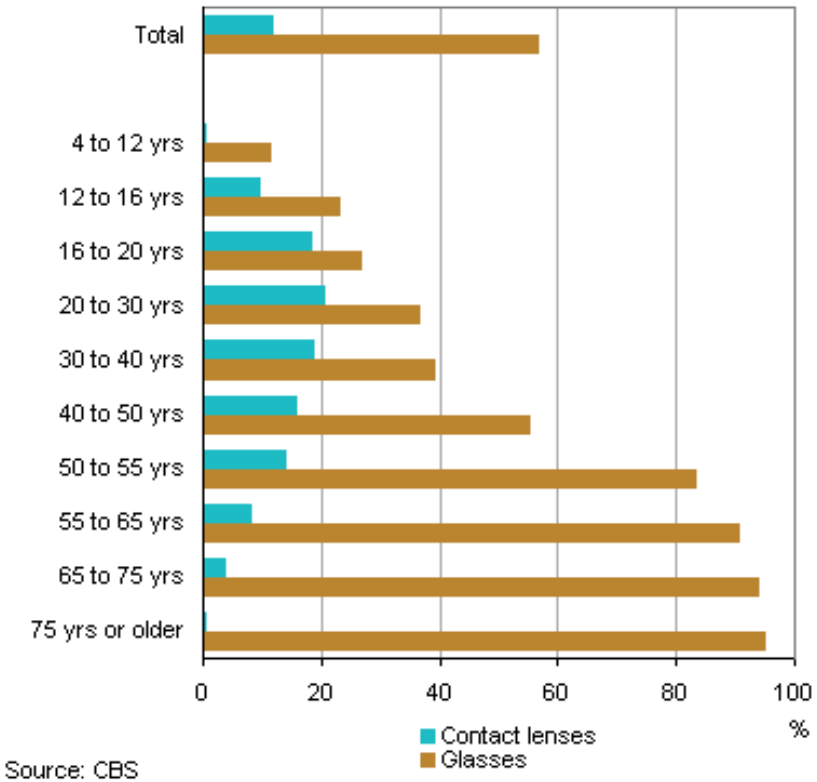
(non-final version, arm will be replaced by a touchscreen)

ENRICHME – First encounter

- Pre-pilot testing with a different robot (Robosoft Kompai)
- Important lessons learned on the limitation of our platform
  - For details, see: R. Agrigoroaie et al., «The ENRICHME Project: Lessons Learnt from a First Interaction with the Elderly », ICSR 2016.

Typical issues with the elderly: vision impairments

- 6 adults out of 10 wear glasses or contact lenses
- This proportion increases dramatically with the elderly

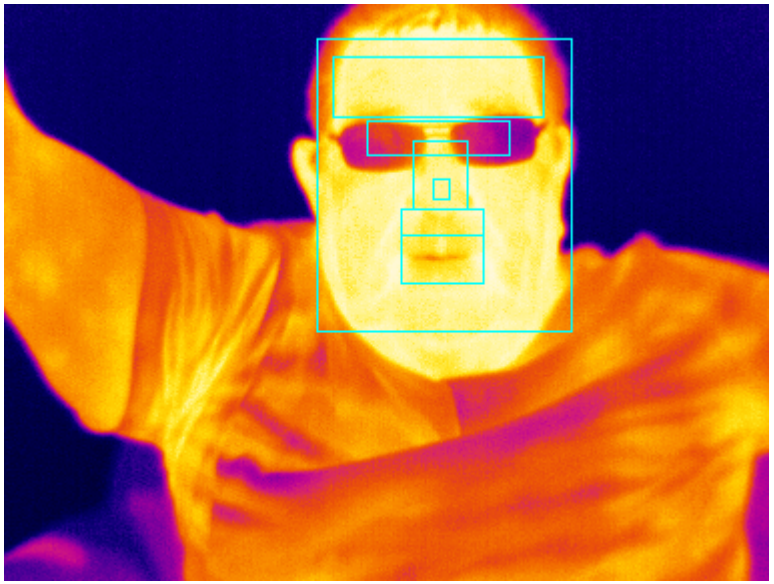


Source: CBS

https://www.cbs.nl/en-gb/news/2013/38/more-than-6-in-10-people-wear-glasses-or-contact-lenses

Typical issues with the elderly: vision impairments

- Impacts thermal data acquisition in the periorbital and perinasal zones.
- Limits eyes-related action units detection for emotion recognition.



Typical issues with the elderly: lack of proper datasets

- Popular datasets for automatic detection or recognition were not necessarily made with the elderly population in mind.
- Because of wrinkles, FACS action units such as « Lip Corner Depressor » are detected much more often.
- Similar problems with voice-based modalities such as prosody analysis and speech recognition.

Issues when working internationally

- Multiple languages necessarily involve more work, but what other impact it might have ?

- A concrete example: « Hangman », one of our cognitive stimulation games
  - Are the translated words present the same difficulty ?
  - What about hints ? Cultural relevance of chosen words ?
  - Can we still compare performance changes in population with different languages ?

- Legal issues: How can we deal with varying reglementation on health data handling ?

General impact of these issues

Such issues limit the transfer of technologies developed in labs with populations largerly composed of graduate students, thus limiting results reproductability.

Issues with technology-oriented development

- Most studies focus on technology development, rather than clinical application
- The majority of studies are exploratory and have methodological limitations
- It will be important to publish some of this research in medical journals in order to have the work evaluated with experts who have clinical expertise in this field.

What can be done ?

- Encourage multi-cultural partnerships
  - A starting point: C. Bartnek et al., « A cross-cultural study on attitudes towards robots », Proc. Symposium on Robot Companions 2005.
- Follow the Child-Robot Interaction community
  - Very similar issues, for instance speech: J. Kennedy et al., « Child Speech Recognition in Human-Robot Interaction: Evaluations and Recommendations », HRI 2017.
- Facilitate the exchange of datasets
  - Already part of the EU Horizon 2020 objectives

Possible datasets

- Synchronized RGB-D, Thermal imagery, and raw audio data, while interacting
- Various robot sensors
  - Odometry
  - Laser range scans (up to 4 m)
- Touchscreen interaction
- Robot behavior

Possible datasets, real-time analysis

- Thermal analysis
  - Average temperature of the whole face and specific features
- Audio analysis
  - Prosody (speech rhythm, tone, accent, …)
- Image analysis
  - Action Units
  - Face recognition

Dataset sharing, challenges

- Large storage requirements
  - Hundreds of gigabytes per experiment
- Privacy issues
- Legal issues: How can we deal with varying reglementation on health data handling ?
- A cultural shift has already begun as leaders in industry, academia, and regulatory agencies recognize the value in increased transparency and data sharing and are focusing on how—instead of why—data should be shared.

Dataset sharing, challenges

- The EU's Data Protection Directive also foresees specific rules for the transfer of personal data outside the EU to ensure the best possible protection of the data when it is exported abroad.

Sensitive Data:

- Data regarding an individual's race or ethnic origin, political opinion, religious beliefs, trade union membership, physical or mental health, sex life, criminal proceedings or convictions (DPA, 1998)

Can only be processed for research purposes if:

- Explicit consent (ideally in writing) has been obtained; or
- Medical research by a health professional or equivalent with duty of confidentiality; or
- Analysis of racial/ethnic origins for purpose of equal opportunities monitoring; or
- In substantial public interest and not causing substantial damage and distress

Conclusion

- The specific needs of the elderly and non-english speakers can limit the integration of interactive modalities already popular in HRI
- The difficulty of technological transfer implicitly impact reproductability
- Publically sharing datasets would help in adapting technologies to be better tailored to the elderly

Thank you!

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