SPRING

GRANT AGREEMENT N. 871245

Deliverable D9.7

Final Advisory Board recommendations

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CONTRIBUTORS AND HISTORY

Version	**Editor**	**Date**	**Change Log**
1	INRIA	14/05/2023	First Draft
Final	INRIA	31/05/2023	Final Draft including Advisory Board input

APPROVALS

Authors/editors	INRIA
Task Leader	INRIA
WP Leader	INRIA

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CONTENTS OF DELIVERABLE

This Deliverable contains the final results of Task 9.2, Advisory Board. Specifically, it features written recommendations from members of SPRING's Advisory Board (AB), after its fourth and final meeting on 15 April 2024, which took place fully remotely at the exception of one AB member. The structure of the document is as follows:

A- Written recommendations, per topic

B- Reproduction of the agenda of the third AB meeting (minutes are not available due to confidential elements shared)

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WRITTEN RECOMMENDATIONS

Q1- HOW WOULD YOU QUALIFY THE PROJECT'S RESULTS OVER ITS FULL COURSE, WITH REGARD TO ITS INITIAL OBJECTIVES?

From Marco Inzitari

In my opinion the results of the project are outstanding. Considering the ambitious goals outlined in the proposal, the technical intricacies of the project, and its focus on involving vulnerable older people as target users (knowing how sensitive and time consuming can be doing research with this population, although absolutely necessary), achieving these outstanding results is commendable. I also appreciate your recognition of the significance of knowledge transfer activities like the winter school.

From Jeffrey Cohn

The project developed a social robot for deployment and testing in a clinical setting. Doing so involved significant challenges in platform design and execution. Beyond standard challenges of robot skills, such as object avoidance, these included multimodal processing of signals from one to two persons in a noisy environment that included additional persons; gaze tracking, emotion detection, and natural language processing; and responding with appropriate affect and content. The project utilized off-the shelf tools where available and created new SOA tools as needed. Results of initial testing suggest that both patient and caregiver participants found their experience with the social robot to be a positive. Over the course of the 4-year period, the consortium produced an astonishing 110 peer-reviewed papers in conferences and journals with additional contributions to graduate and post-graduate training and summer workshops.

From William Kearns

I think the team has made excellent progress, given the difficulty of the assignment to work with persons with dementia in professional care settings and using a robotic platform with significant limitations both in audio transmission and reception, and in stereoscopic vision (problematic camera location and orientation on the robot).

From Louis-Philippe Morency

Great achievements for a well coordinated project with many research outcomes.

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Q2- WHAT DO YOU THINK OF THE RESULTS OF THE EXPERIMENTAL PHASES IN THE HOSPITAL WITH ELDERLY PATIENTS, ACCOMPANYING PERSONS AND STAFF (IN PARTICULAR IN TERMS OF ACCEPTABILITY AND USABILITY)?

From Marco Inzitari

Real-life pilots and experiments involving frail populations serve as invaluable sources of learning, crucial for advancing the interaction and support provided by robots in real-life living environments, especially within healthcare contexts. Although the tasks assigned to robots may not have initially targeted specific healthcare functions, even these supportive tasks can supplement professionals' activities and free them from tasks deemed to have "low added value." Looking forward, robots have the potential to take on additional value-based tasks such as education, thereby further augmenting their role in healthcare and other domains.

From Jeffrey Cohn

The quantitative results suggest that both patient and caregiver participants found interaction with the robot socially acceptable and usable. Further testing could evaluate the relative contribution of robot communication via text display vs. speech, usability and accessibility as a function of degree of impairment, regional accents and individual differences (e.g., gender, SES, and native vs. non-native speaker), and for patient participants degree of scaffolding provided by caregivers.

From William Kearns

It appears that the speech recognition still has a way to go before it is ready for distribution. The tendency for the robot to answer a completely different question than the one asked by the caregiver creates doubts in the minds of the participants and will cause the participants to regard the robot as a curiosity without much practical significance, or worse that the device has no significance at all. This should be guarded against since it undermines the public's perception of the usability of robots in general. In terms of the robot's interaction with the evaluators, it did not seem that the robot was employing any of its features that made it a robot. Since it was only answering queries and displaying text on it's LCD, its functionality could have been duplicated using a tablet mounted on the wall. None of the motor skills of the robot were demonstrated (head moving to engage the viewer, arms and hands being used to gesture or provide direction concerning where offices may be located, etc.). The lack of any human mimicry to engage the test subjects suggests that most of the features of the robotic platform were not being utilized and it really should be.

From Louis-Philippe Morency

A study within hospital is always a challenge to organize and it will bring valuable information for future research on this topic.

Q3 - WHAT ARE IN YOUR OPINIONS THE LIMITATIONS OF FOUNDATION MODELS (LANGUAGE, VISION, AUDIO ROBOTICS) FOR TECHNOLOGICAL DEPLOYMENT? WHAT ARE IN YOUR OPINIONS THE PRACTICAL LIMITATIONS OF THE ROBOT FOR DEPLOYMENT IN HEALTH-RELATED ENVIRONMENTS?

From Marco Inzitari (response also to Q4)

At present, there is a multitude of projects and experiments aimed at incorporating robots into activities tailored for older adults. These range from social robots designed to alleviate social isolation to robots aiding in the assessment of older adults and even providing interventions. Refining these robots to offer support in real-world environments necessitates the involvement and co-design with healthcare professionals. Moreover, there may be a need to develop different types of robots to customize care according to individual needs and profiles. Additionally, it is imperative to undertake future projects aimed at deepening our understanding of the potential impacts of robots on society and healthcare. This could involve engaging professionals, building upon the initial inspiration of initiatives such as the winter school, to gather insights and perspectives crucial for advancing this field.

From Jeffrey Cohn

The deployed perception of facial affect is relatively simplistic. It attempts to classify positive versus negative valence. These "states" are not native to the circumplex model of affect. Valence is a dimension. Further, in the clinical setting, most facial expression is likely to be of relatively neutral affect and negative affect sparse. How would the robot perform in emotion recognition? One would anticipate that a two-state solution would be highly prone to error. This, of course, could be tested empirically through manual annotation of user responses.

It would be informative to explore vocal affect in speech behavior as well. Manual ratings by observers could be highly informative in evaluating the validity of robot perception and expression of emotion. Bear in mind that for generative communication, a signal-based rather than dimensional base might be more useful. How would inconsistencies between modalities be handled?

Input from occupational therapists and other clinical staff would be useful in choosing functions for the robot. What functions would various clinical staff see as important? Develop a clinically informed repertoire for the robot and evaluate its specific performance in achieving each of those functions. Analyze scaffolding strategies of caregivers and the extent to which the robot can make those less necessary.

From William Kearns

The ARI robot has significant limitations both in audio transmission and reception due to the co-location of the microphone and speaker which prohibits audio reception while the robot is talking. It was not discussed as to whether the microphone and the speaker had been separated to allow the simultaneous processing of audio input and output. Also, I think the stereoscopic vision function using 3 fish-eye lens cameras (one in the chest, and one on either "shoulder" area) are problematic camera locations and orientations on the robot from the perspective of using machine vision to gauge distance to target using a 3 camera solution.

In terms of deploying the robot in a healthcare environment, especially a crowded waiting room, the robot's "footprint" is quite large, suggesting that it may have difficulty negotiating narrow passages between older adults seated in waiting areas. In our research we have seen that individuals with traumatic brain injury sometimes develop paranoid ideation concerning machine surveillance systems like robots and machine vision based tracking solutions. In some cases the patients actively work to defeat the robotic surveillance system in their living areas for fear that the machine is watching them.

From Louis-Philippe Morency

One typical challenge for most foundation models is the long-tail distribution. New behaviors and actions will happen that were not expected. This is something challenging for all foundation models. The impact of any hallucination will be larger in healthcare setting.

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Q4- IS THERE ONE SPECIFIC DIRECTION OR CHALLENGE THAT YOU WOULD LIKE THE SPRING PARTNERS, OR IN A LARGER PERSPECTIVE, LARGE SCALE PROJECTS IN SOCIAL ROBOTICS, ADDRESS IN THE UPCOMING YEARS ?

From Jeffrey Cohn

Further thought might be given to the contexts in which social robot would be deployed. In a day-treatment setting, for instance, social robot may be less necessary than in a home or assisted living facility. In clinic, volunteers often are available and provide a measure of contact that may be difficult to achieve in a social robot. In home care, on the other hand, a social "partner" or "caregiver" capable of limited conversation and perhaps physical contact and assistance with basic tasks could be very useful.

The SPRING consortium has made huge strides toward developing acceptable and usable social robot. For a next step, what's needed is an ethogram of the functions required by a social robot in various clinical and home environments. I would strongly recommend active input and evaluation by clinical experts in relevant domains and increased involvement of behavioral researchers in design and evaluation.

Thank you for the privilege to serve on the advisory board of this important, ground-breaking initiative. You have accomplished great work that contributes mightily to the development and contribution of social robots for patient care in diverse, clinically relevant settings.

From William Kearns

I think the SPRING project has made significant inroads on addressing a difficult problem for hospital and formal care environments that are faced with staffing shortages. Dementia care augmentation using robotics may benefit from solutions to problems such as elopement from a home or facility. For example if the robot could sense agitation and confusion in an older adult and take steps to deescalate the agitation (calm the older adult) and act to prevent the PWD (person with dementia) from eloping from the home or care facility. For many older adults, the home or facility becomes like a prison and they go to great lengths to defeat security measures intended to keep them from running away and becoming lost and even killed by accident. A robot that could be programed to spot behaviors that precede an elopement would be very useful to facility managers and caregivers. A robot that could assist in the recovery of a lost elder who wandered away from a facility would also be desirable, duplicating the behavior of a trained rescue dog capable of tracking the PWD and bringing them home.

From Louis-Philippe Morency

While I value greatly the embodiment of the robot and the in-person interactions, it would be interesting to expand to virtual settings, where the embodiment could be more complex, but the social interactions would be different.

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FINAL ADVISORY BOARD MEETING AGENDA

PARTICIPANTS

Advisory Board Members

- Christine Hubert, President, Association Jean-Baptiste THIERY (AJBT) **[Absent]**
- Laurent Zanetton, President, Groupement Hospitalier Nord-Dauphine (GHND) **[Present]**
- Jacques Hubert, Executive Director in charge of Medical Strategy, Groupe Hospitalier de l'Est de la Meurthe et Moselle (GHEMM) **[Absent]**
- Marco Inzitari, President, Societat Catalana de Geriatria I Gerontologia (SCGiG) **[Present]**
- William Kearns, Past President, International Society for Gerontechnology (ISC) **[Present]**
- Jose M Alvarez, Senior Research Scientist, NVIDIA **[Present]**
- Jeffrey Cohn, Professor, Department of Psychology, University of Pittsburg **[Present]**
- Louis-Philippe. Morency, Professor, Carnegie Mellon University (CMU) **[Present]**
- Ramesh Jain, Professor, University of California Irvine **[Present, on-site]**

SPRING Consortium Members

From the National Institute for Research in Digital Science and Technology (INRIA, France):

- Xavier Alameda-Pineda (project coordinator)
- Chris Reinke (WP6 Leader)
- Matthieu Py (WP8 Leader, project manager)

From the University of Trento (UNITN, Italy):

- Elisa Ricci (WP4 Leader)

From the Czech technical university in Prague (CVUT, Czech Republic):

- Michal Polic (WP2 Leader)

From Heriot-Watt University (HWU, UK):

- Christian Dondrup (WP5 Leader)

From Bar-Ilan University (BIU, Israel)

- Sharon Gannot (WP3 Leader)
- Pini Tandeitnik

From ERM Automatismes Industriels (ERM, France) :

- Cyril Liotard (WP1 Leader)

From PAL Robotics (PAL, Spain)

- Séverin Lemaignant (WP7 Leader)
- Marco Rosa

From Assistance Publique–Hôpitaux de Paris (APHP, France)

- Anne-Sophie Rigaud (WP10 Leader, remote)
- Lauriane Blavette

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FINAL AB MEETING AGENDA

The Final AB meeting had two components: one with in-person presentations and live demonstration of the robot for Members who could come on-site (afternoon), and one plenary (evening, hybrid). The afternoon demonstration had two tracks: one in French and one in English, to accommodate for the different needs of the AB Members, in particular for the Members part of French health-sector institutions who could not attend the two previous meetings.

Key info

When: April 15th, 2024, 17h-19h (CEST)

Online

Schedule

- 17h00: Introduction & dissemination [INRIA]
- 17h10: WP2-4 Perception [BIU, UNITN, CVUT]
- 17h25: WP5-7 Action & architecture [HWU, INRIA, PAL]
- 17h40: Hospital experiments & feedback [ERM, APHP]
- 18h10: Internal AB members discussion (SPRING members disconnect for 10 minutes)
- 18h20: Feedback from AB
- 18h30: Presentation & discussion on future perspectives [INRIA]
- 18h50 Wrap-up