VISUAAL - The Doctoral Seminar



Coláiste na Tríonóide, Baile Átha Cliath Trinity College Dublin Ollscoil Átha Cliath | The University of Dublin

Privacy-Aware Embodied Intelligence for Robots in Assistive Living Environments

ESR 9. HASSAN ZAAL





About me:

- I am from Syria.
- BSc in Computer and Automation Engineering Damascus University, Syria.
- Postgraduate Diploma in Vision and Robotics (VIBOT) Heriot- Watt University, UK.
 - I spent a semester at Bourgogne University in France.
 - I spent a semester at Girona University in Spain.



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Life Expectancy & Multimorbidity

- We are ageing.
- The increase in life expectancy does not mean an increase in "healthy life expectancy".
- Multimorbidity is the coexistence of two or more chronic conditions in the same individual.
 - A physical disease of long duration, such as cancer.
 - A mental health condition of lung duration, such as dementia.
- Technology enabled self-management.





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Robot in Assistive Living Environment

- Robots can assist individuals and extend their independent living
 - Robots can provide physical assistance or move to "blind spots" in camera coverage when needed.
- Safe and effective interaction with technology requires and effective interface e.g. voice, graphical displays, etc.
 - Robots can also communicate physically by facing the corner, moving away etc. in response to user instructions









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Healthcare Robots for Older People

(g) Astro (Amazon)

(h) Bomy



Evaluation of Healthcare Robots for Older People

- Activities of Daily Living (ADLs):
 - Transferring
 - Dressing
 - Personal Hygiene
 - Toileting

• Instrumental ADLs (IADLs):

- Transportation and Shopping
- Managing Finances
- Meal Preparation
- Managing Medications
- Managing Communications





Evaluation of Healthcare Robots for Older People

	Users' Needs																	
Social	Managing finances	Driving	Laundry	Housework	Using the phone	Managing medications	Cooking	Shopping	Climbing stairs	Walking	Transferring	Toileting	Feeding	Mouth care	Grooming	Dressing	Bathing	ADLs/IADLs/Social
										х	х							ASTRO
													х					Jaco
										х	х							ReWalk
х																		PARO
х																		AIBO
						х												Care-O-bot 4
х																		Astro (Amazon)*
х						х												Bomy





Use Case Scenario



Cara, 87 years old, used to work in kindergarten as a teacher. Her husband died 15 years ago and her son died 3 years ago. Her grandchildren working overseas, so she do not see them that much. Cara has a lung cancer and she is under medications.

Cara wears glasses to correct her visual impairment. Unfortunately, she always forget them after bath, waking-up, etc. She usually spend times looking for her glasses, key, etc.

What she would like is a personal assistant robot that can interact with similar to the interactions between humans. She would like the robot to understand her spoken language and allocate to her missing glasses or a missing key, etc. She would like the robot to trailer educational and training interventions, to personalised to her self-management needs.



Users' Needs

Examples of responses gathered from old adults about their needs

- "I like the alarm function of the robot. I know of people who fell and who have been lying on the floor for hours because they could not reach their social alarm."
- "The exercises I would find useful. That the physiotherapist does not have to come to my house, and I do not have to go there."
- "If you have troubles getting out of bed, then he can help. You can also walk behind him instead of using a walker"

Examples of responses gathered from caregivers about their needs

- "It would be nice if the robot could lift people, or help them turn over in their bed. That would really ease our work, because now we have to ask a colleague."
- "What I would find useful is that you can call the robot to help when someone has to go to use for other people." the bathroom, or has to go from one room to the other. That will save me time that I can

Examples of responses gathered from clinicians about their expectations

- Better self-management of the patients' health status.
- Less unnecessary visits.
- Enhanced patient confidence.
- Better patient's social interactions





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Privacy and Security Awareness

- Set needs and preferences.
 - Different operation modes (awake, sleep, etc.).
- Privacy and Security concerns in vision- and voice-based working solutions for assisted living.
 - Different Access Level
 - Different Privacy Zone
 - Who can command the robot?
 - In person
 - Remotely





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Available Resources:

- PAL Tiago.
 - 12 Degree of Freedom Arm.
- WUMPUS with the Interactive Avatar.















Understanding Language, Visual Grounding, and Actions

• By the time we reach the opposite **bank**, the **boat** was sinking fast.



Block Diagram for the PhD Stages





Plan for Secondments and Targeted Conferences

- IBM Ireland Limited.
- University of Alicante.
- ACM/IEEE International Conference on Human-Robot Interaction (HRI)
- Conferences of Association for the Advancement of Assisitve Technology in Europe (AAATE)
- International Conference on Robotics and Automation (ICRA)
- International Conference on Intelligent Robots and Systems (IROS)
- Embodied AI Workshop from Conference on Computer Vision and Pattern **Recognition (CVPR)**



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Thank You for Listening



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