



WONDER

Setting up a humanoid robot for automated, personalized support in residential care

Senior citizens who live in nursing homes – especially those with dementia – require constant attention. At times they may become anxious or confused, or even start wandering around and lose their way. In this project we aimed to combine a humanoid robot and IoT sensor technology into a 24/7 interactive and personalized care service, a service to keep a constant eye on residents and intervene when necessary, using personalized feedback to calm them down. Such an additional service will complement the human touch of the caregivers, reduce the need for pharmaceutical interventions or physical restrictions, and thus improve the quality of life of the residents.

Humanoid robots such as Zora have already been deployed in nursing homes. They have been used with success in, e.g., supervised physical exercises or entertainment. But in that setting they are center stage and they don't have to move in complex surroundings and interact with individual residents. "To make Zora suitable for personalized interventions and care, there are a few challenges that this project set out to solve," says Pieter Simoons, research leader and professor at IDLab, an imec research group at UGent. "One was to make the robot aware of the context of the nursing home and its people. This requires deploying sensors that communicate with the robot and that show where the residents are, who they are, and what they are doing. Also, to make the interaction between a robot and a resident effective, the interaction needed to be friendly and personalized. Additionally, e.g. in the case of patients wandering about, the robot had to be able to move around autonomously."

The project partners have been selected for their complementarity, so that each contributed key elements of the solution. Zora Robotics is a supplier of the Zora robots, which it has programmed for deployment in residential care. Xetal develops sensor technology for indoor localization of people and activity recognition. The two nursing homes are real living labs

where cocreation and gradual improvement of the service can be done. And the research groups have extensive experience with IoT data gathering, knowledge mining and field studies to test technology acceptance.

THE OUTCOMES

"In this project, we had the unprecedented opportunity to create a semi-automated care service in a real care environment," says Tommy Deblieck, project leader and CEO of Zora Robotics. "This enabled the technologists, caregivers, and researchers to keep refining the concept, learning additional possibilities and discovering the limits set by the residents."

1. Personalized robot interventions triggered by IoT observations

Originally, Zora was a standalone robot acting only on its own sensors. But to ensure automated, personalized care, it had to become aware of its environment and the people in it. Wearables and wall-mounted location and activity sensors are used to detect behavioral disturbances. A decision support framework then decides to alert a nurse or send the robot. The robot gives personalized feedback to residents, e.g. positive memories or pastimes that have been entered by caregivers or family. Both the decision algorithm and the personalization were the result of an intensive co-design process between computer scientists, social experts and caregivers.

2. Selecting and developing suitable sensors to track the whereabouts and activities of people

Designing suitable sensors for nursing homes has proven a challenge: residents suffering from dementia do not trust conspicuous sensors and some will rip them off the wall. First, the partners looked for a suitable wearable that would go with the patients but that was invisible and unobtrusive. The best choice turned out to be a shoe-mounted sensor. Second, the project

also needed sensors to locate people and track their activities. So Xetal further adapted its sensors so they could be fitted into an unobtrusive housing and they implemented new activity-tracking algorithms. These sensors are not cameras but use proprietary technology, so the privacy remains guaranteed.

3. A platform to move Zora swiftly to where it is needed

Zora can walk, but only slowly. So when it has to intervene tens to hundreds of meters from where it sits, it needs to be transported. To that end, the project partners developed a platform in the form of a small vehicle that brings Zora to the resident who needs attention. The vehicle has been co-designed with the caregivers so as to have the best-suited form and color.

NEXT STEPS

For the companies and nursing homes involved, this has been an eye-opening project. Both Zora Robotics and Xetal developed and adapted technology for the reality of residential care. These building blocks are now ready to be further developed in their respective product portfolios. The nursing homes have had a very positive experience and have become ambassadors for the use of this type of technology to improve the quality of care. Finally, adds Pieter Simoens, “the researchers are already using these results as a stepping stone, looking how a humanoid robot can be deployed in a more unstructured environment, e.g. in homes or offices.”

WONDER project partners:



AGENTSCHAP INNOVEREN & ONDERNEMEN



Vlaanderen is ondernemen

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FACTS

NAME	WONDER (Interactive, Automated Support for Personalized Care Services)
OBJECTIVE	WONDER aims to develop an automated and interactive 24/7 care service with Zora — a humanoid robot. Zora will e.g. be used to trigger positive personal memories in dementia patients to reassure and calm them.
TECHNOLOGIES USED	Co-creation, robotics, indoor localization sensing, wearables
TYPE	imec.icon project
DURATION	01/10/2015 - 30/09/2017
PROJECT LEAD	Tommy Deblieck, Zora Robotics
RESEARCH LEAD	Pieter Simoens, IDLab, an imec research group at UGent
BUDGET	1,520,128 euro
PROJECT PARTNERS	Zora Robotics, Xetal, WZC Weverbos, WZC De Vijvers
IMEC RESEARCH GROUPS	IDLab, an imec research group at UGent SMIT, an imec research group at VUB



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The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and / or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

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