

Impact Objectives

- Develop robots for elderly people living alone, looking at both preventive care and disaster prevention functions
- Investigate how artificial intelligence (AI) can provide long-term care to offset shortages of social welfare professionals

Can robots be part of the family?

Professor Noriko Kawashima discusses her work as part of a multi-disciplinary team on the use of robots providing multi-layered support for elderly people living alone



What inspired you to become involved in robotics?

My interests lie in social welfare. I am also interested

in the positive relationship between the social capital of a community and the health of individual elderly citizens residing in the community. I was inspired to start the project after completing a previous project on the development of rules for AI in replacing long-term care (LTC) administration. I was interested to consider whether, if people accept AI in LTC administration, then AI could also be used to provide LTC to offset the social welfare professional shortage.

From your perspective, what are some of the main challenges of a rapidly ageing society in regards to long-term healthcare?

The biggest challenge will be the shortage of

LTC human resourcing. Population ageing means that the working force is declining in size. Japan, one of the most rapidly ageing countries in the world, is already facing this challenge. We must solve the issue of sufficient labour supply and we believe that shortage can be answered by using robots and IT technologies.

How important is taking a multi-layered approach to your current research?

The multi-layered approach is whole-generational and whole-target social support. It is defined in Japan's Social Welfare Act. It should be administered at a local level to enhance community welfare. However, social welfare human resourcing is in short supply due to our declining population. The irony is that as our need increases for greater human resourcing to care for our ageing population, the supply is decreasing due to our falling birthrates. To compensate for the shortage, we need an alternative and we believe that robots can be used to administer the multi-layered

approach necessary to provide the support needed.

How are you collaborating with other academic institutions or the healthcare sector in this work?

Collaboration with other institutions is planned for the disaster prevention field. This project involves a collaboration with Kyoto University Institute of Disaster Management, National Institute of Disaster Prevention in Tsukuba and Doshisha University's Inclusive Disaster Prevention Research Center as well as the Personal Health Record (PHR) Association. The extramural researchers will contribute to the project, advising on what types of alerts the solitary-dwelling elderly will most need in case of disaster so that the project will be able to effectively equip robots with necessary alerting functions. ●

Programming a caring solution

In efforts to tackle the ageing population crisis in Japan, a multi-disciplinary team of researchers is collaborating to use AI-enabled robots to monitor and care for vulnerable and lonely elderly citizens

The ratio of elderly and those in need of additional care compared to able bodied workers has been growing, leading to a demand for care that far outstrips supply. With technology advancing at incredible rates, the use of AI and robotics can be an ideal solution to this problem.

Researchers from the Department of Health & Welfare Management at the University of Fukuchiyama in Japan are leading the movement to develop robots which can monitor the health and independence of solitary-dwelling elderly people. In doing so, they hope to prevent situations in which these vulnerable citizens suffer falls and other health disasters while they are alone and unattended.

The team is led by principal investigator Professor Noriko Kawashima, whose social welfare background motivated her to consider how technology and AI can be used to fill in the gaps in long term care (LTC) provisions. She works alongside her colleagues Professor Etsuji Okamoto, a public health physician from the Department of Health & Welfare Management and Professor Itaru Kuramoto, a robotics specialist from the Faculty of Informatics. They are joined by Professor

Shigeo Tatsuki, a specialist in disaster prevention from Doshisha University; and disaster prevention expert Professor Katsuya Yamori from Kyoto University.

Okamoto, who heads up the health maintenance team, explains that their work looks at how robots may be able to offer round-the-clock care. 'Our study zeroes in on the policy importance of reducing the risks of adverse events such as unattended deaths or medical emergencies in solitary-dwelling elderly by offering 24-hour observation by robots,' she outlines. 'By using robots to monitor and engage with the elderly, we hope to ensure prompt alerts in emergencies, reduce the risk of dementia and alleviate the very real threat of loneliness in this often-isolated population.' This team emphasises the importance of optimising the benefits of generative AI technology in LTC, which is known to be a highly labour-intensive field.

HARNESSING AI

The study aims to build on existing robotic technology as well as generative AI to develop robots that can constantly monitor the health of their charges as well as fulfilling the role of a companion. The team will programme the robots with both question-and-answer style

dialogues and a variety of daily conversations using the large language model (LLM) to enable them to offer entertainment and companionship to their elderly charges. The robots would also gather data based on the answers given to them and learn from these, improving their friendliness and trustfulness. Information on a variety of topics such as welfare or disaster prevention can also be dispensed by the robots, making them an invaluable form of communication with the outside world.

The team plans to utilise the Japan-wide Myna portal, a portal site administered by the Data Agency, to access and update the individual personal health records held for each user. A new electric health record (EHR) sharing service on the Myna portal will allow health information to be shared between different providers to better inform healthcare providers and therefore offers users an improved service. 'The robots will be programmed to analyse the received health records, compared with the normal range of each laboratory data and send emails to the designated healthcare professionals such as attending doctors or visiting nurses,' describes Kawashima. ►



‘The goal of this work is to provide local municipal government regional integrated care support centres with robots that can be loaned to residents free of charge’

This interactive feature will help ensure that health issues are monitored, and any changes can be picked up quickly, allowing timely intervention where necessary.

The project is scheduled to run for three years and in the final year, the team plans to field test the robots they create by recruiting elderly volunteers who live alone to try them for a set period. The field sites will be the cities and towns of Fukuchiyama, Maizuru, Miyazu and Ine, all of which are in the northern part of Kyoto prefecture.

INVALUABLE ASSISTANCE

The group's groundbreaking ideas for the project offer the potential for exciting new possibilities in the field of social welfare. However, with this novelty comes its challenges. 'The potential of AI and robots in assisting social welfare services was not well understood by peers in the initial phase of the project,' describes Kawashima. 'Communication and education have been central to overcoming challenges between researchers and the emergence of ChatGPT has greatly changed perceptions.'

Kawashima's presentation on the group's work at the Natural Hazards Research & Application Workshop held in the US in July 2024 received a great deal of attention as many of those involved in the field saw the potential in the project. In the future the robots can be incorporated into municipality governments' disaster preparation plans, as they will be able to monitor local conditions and alert their charges regarding potential evacuations to allow ample time to prepare. This is especially important given the earthquake and flooding risks experienced in Japan, and this could also

benefit isolated elderly people in other areas around the world. In Fukuchiyama alone, where several of the team are based, there are over 3,000 vulnerable citizens who require additional assistance in the event of disaster. Developing robots that can aid in alerting and assisting these people would be a considerable advantage during a crisis.

Sharing ideas on how these robots can help solitary-dwelling elderly people has been an important part of the project as the group is keen to spread the benefits that the robots can offer to vulnerable groups within society. In highlighting the features of this technology, they hope that more local governments and health authorities will implement the use of the robots for their local people who may benefit.

THE NEXT STEPS

'The goal of this work is to provide local municipal government regional integrated care support centres with robots that can be loaned to residents free of charge,' outlines Kawashima. The group believes that the robots will not only relieve the social care burden by providing the labour and monitoring that Japan's population is unable to support, but that the cost will also be supported through existing healthcare insurance policies.

With the rapid development of generative AI in recent years, together with the increasing affordability of robotic technology, the team hope to see their robots being made freely available to assist and monitor elderly people. Judging from Japan's anomalous population pyramid, a sharp increase in solitary-dwelling elderly is anticipated, which necessitates greater demand for monitoring robots.

With particular emphasis on those living alone, a group that is set to increase significantly, these robots can provide peace of mind and companionship for many. ●

Project Insights

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BIO

Noriko Kawashima is a professor of Health & Welfare Management at the University of Fukuchiyama. She graduated from Doshisha University with a PhD in Social Science. Kawashima's research interests are in social welfare.

