

# Dashboard bot helps ageing drivers take more care

Re-educating older drivers might require the gentle **GUIDANCE OF A ROBOT.**

Japan, the 'greyest' country in the world, has seen a huge increase in the proportion of its elderly drivers, and subsequently its accident rate. But researchers from Nagoya University have recently demonstrated that the congenial feedback of a 15cm dashboard robot could help older drivers slow their passing speeds and deceleration times.

Nearly 30% of the Japanese population is aged 65 and above. For this age group, surrendering their license "lowers quality of life and increases the probability of developing dementia, which is already a concern for Japan's ageing society, according to Takahiro Tanaka from the Institute of Innovation for Future Society at Nagoya University.

For the past decade, Tanaka and his Nagoya University colleagues have been working with collaborators at Toyota Motor Corporation to eliminate traffic fatalities and develop technology to help the elderly maintain their driving independence.

## DEADLY CRASHES DOUBLED

According to Japan's police data, drivers aged 75 and older were responsible for 14.4% of fatal traffic accidents in 2019. With

an incident rate of 6.9 deadly crashes per 100,000, this is more than double the accidents caused by those under 75.

The reason for the decline in driving proficiency with age is two-fold, says Tanaka. The first is biological — vision deteriorates as one gets older, as does the ability to concentrate and multitask. "Focusing on several targets at the same time is difficult for the elderly," he explains. "The other reason is the excessive confidence that comes from many years of driving experience," says Tanaka. "If their family tries to explain the problem to them, the elderly driver often refuses or finds it hard to change their behaviour."

With this in mind, the researchers developed a system, Driver Agent, to encourage safe driving behaviour. It comprises a smartphone and a small, commercially available robot called RoBoHoN® that sits in the corner of the dashboard. The two are linked to each other, and also to the cloud.

A smartphone app, which Tanaka and his collaborators have made available to download for free on the Google Play Store, controls the system. It contains maps



highlighting where traffic intersections are, as well as other useful information such as speed limits. The app also receives data about the driver's speed, the car's distance to surrounding vehicles and pedestrians, from cameras and other connected devices.

This in turn allows the Driver Agent to provide real-time support, which the robot delivers in a friendly tone or with slight physical arm or head motions. For instance, it might alert the drivers as they approach intersections (where the majority of accidents involving the elderly occur), or highlight that someone is speeding.

## VIDEO REPLAY

In Japan, having a robot offering advice was preferable to simply

displaying the information on a smartphone, or using a voice agent, such as a car navigation system, the researchers discovered. "The robot form is more noticeable, familiar, and acceptable to the elderly and non-elderly than other forms," they concluded in a 2018 paper.

Apart from offering real-time support, the Driver Agent is also capable of evaluating a driver's behaviour and providing feedback. "The agent can pick up both good and bad points," explains Tanaka, whose work is part of a Center of Innovation programme funded by the government's Japan Science and Technology Agency. "For example, it can tell you that you did well at this intersection, or that you should have reduced your speed."

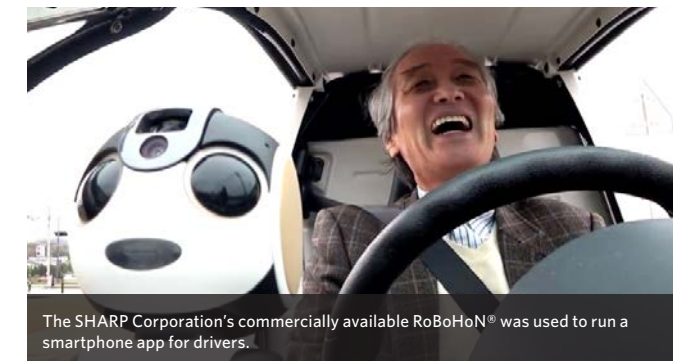
Feedback is also provided in the form of 10-second videos depicting the scene in question accompanied by commentary from the robot. "The driver can see this and understand the need for driving improvement," says Tanaka. "We have found that when the elderly have self-awareness of their driving, they can adjust accordingly, and therefore there is a lower risk of accidents."

## RESULTS ON THE ROAD

When used together, Driver Agent's dual offerings, of real-time support and post-driving review, have proven helpful in amending behaviour. In a 2020 publication, Tanaka and his collaborators describe testing participants over three weeks using the system superimposed onto a driving simulator.

In one series of tests they looked at safe confirmation times, the period of time at an intersection when drivers slow their vehicle to less than 1 kilometre per hour in order to check for crossing cars. In the experiment, about 30 elderly drivers who used Driver Agent were found to have increased their safe confirmation times from 1.7 seconds to 3.6 seconds. Moreover, their passing speed, the speed at which drivers passed by parked cars or pedestrians, was reduced from 31.9 km/h to 16.1 km/h — within the 20km/h limit recommended by local driving instructors and police.

Driver Agent has also proven effective in real-world experiments. In a study conducted by Tanaka and his collaborators in 2020 just



outside Nagoya University, participants were found to have significantly reduced their speed and increased their safe confirmation times when using the system in their vehicles.

"Similar to the experimental results in the simulator, we were able to confirm the acceptability of the robot and the effect on improved driving behaviour," says Tanaka. "We also showed that the presence of the robot did not interfere with driving."

More recently, the researchers expanded their study to a wider age range of participants. Results from the experiment, which ran from August to December 2021, are expected to be published early in 2022.

In the future, Tanaka and his team hope to commercialize their invention and make it

available to car manufacturers. By doing so, he hopes that Driver Agent will be able to provide "a new option to elderly drivers, other than handing in their driver's license or waiting for a fully autonomous vehicle".

At the end of 2019, close to six million over-75s continued to hold driving licenses in Japan. "We recognize that mobility is very important to elderly people's lives," says Tanaka. "We would like to provide them with a safe way to extend their driving life." ■



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